AMERICAN CINEMATOGRAPHER

The Motion Picture CAMERA Magazine

December 1933

PRICE 25c

Published in Hollywood
by the
American Society of
Cinematographers

this issue

Infra Red Photography
Systematized Minature Development
Photography of the Month
. . . and other features

for the amateur

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Mechanics of 16mm Titles
One, Two, Three of Indoor Lighting
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Next Month

• We will launch the first of a series of articles on the Fundamentals of Design in Photography. This will be written by L. O. Huggins, A.S.C. He will take each of the fundamentals and treat them separately in each article.

• Other timely and interesting articles are in preparation. They will treat on the various phases of the technical side of photography and cinematography.

• There will be another article on miniature photography. This article promises something very new in the use of the small camera. It will demonstrate the wide flexibility of the ever popular candid camera.

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NEW G-E MAZDA MOVIEFLOOD LAMP

THIS amazing new lamp puts a helpful new tool in the hands of the cinematographer, with these definite advantages:

1 **Brighter light.** This new G-E MAZDA Movieflood lamp, rated at 2000 watts, gives twice as much light as the standard 1500-watt lamp. Photographically, it is 3 times as effective. Thus fewer units are needed on the set and more natural effects are possible.

2 **Whiter light.** The light from this new lamp matches very closely the sensitivity of super pan film, which results in a more pleasing rendition of tone and texture. It brings out black tones especially well, and does not overemphasize red tones.

3 **Better light balances.** The increased intensity of this new lamp seems to give its light greater carrying power, which makes shadows softer and more natural, while highlights still retain desirable softness and definition.

4 **Less heat** — in proportion to light. This new lamp produces less infra red, or heat rays, from an equal wattage than a standard lamp. This means greater comfort for everyone on the set . . . especially in color photography, where the higher intensity light necessary often boosted the temperature to that of the tropics.

5 **Designed for color work.** Because of its coolness, intensity and color quality, this new lamp greatly simplifies the problem of lighting for color.

This new G-E MAZDA Movieflood lamp has a life of about 15 hours. It may be prolonged by operating at reduced voltage when not shooting.

Typical of General Electric's constant contributions to better photography—this new lamp suggests another reason why studios from coast to coast use G-E MAZDA lamps for all their lighting, from set to "process" work. General Electric Company, Nela Park, Cleveland, O.

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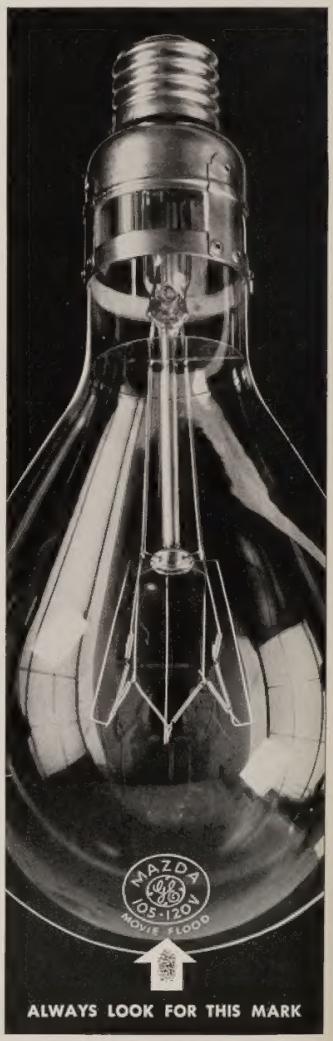

THE AMERICAN SOCIETY OF CINEMATOGRAPHERS was founded in 1918 for the purpose of bringing into closer confederation and cooperation all those leaders in the cinematographic art and science whose aim is and ever will be to strive for pre-eminence in artistic perfection and technical mastery of this art and science. Its purpose is to further the artistic and scientific advancement of the cinema and its allied crafts through unceasing research and experimentation as well as through bringing the artists and the scientists of cinematography into more intimate fellowship. To this end its membership is composed of the outstanding cinematographers of the world, with Associate and Honorary memberships bestowed upon those who, though not active cinematographers, are engaged none the less in kindred pursuits, and who have, by their achievements, contributed outstandingly to the progress of cinematography as an Art or as a Science. To further these lofty aims, and to fittingly chronicle the progress of cinematography, the Society's publication, The American Cinematographer, is dedicated.

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Letter from Mr. John M. Nickolaus, M-G-M Superintendent of Photography, to Mr. J. H. McNabb, President, Bell & Howell Company, describing the work of one of M-G-M's battery of new Bell & Howell Sound and Picture Production Printers.

METRO-GOLDWYN-MAYER STUDIOS

CULVER CITY, CALIFORNIA October 10th, 1933.

Mr. J. H. McNabb,
Bell and Howell Company,
1801-1815 Larchmont Ave.,
Chicago, Illinois.

Dear Mr. McNabb:

Recently we had an order for one-thousand prints from an N.R.A. trailer negative, which were wanted in a rush for exploitation. We decided to put this negative into the new automatic printing machine, and ran it continuously for twenty-four hours per day, until the one-thousand prints were made, never taking the negative from the cabinet during the entire process.

During the progress of this work we examined the prints carefully, and found the one-thousandth print as clean as the first. I guess we could have gone on printing indefinitely.

I personally examined this negative at the finish of the run, and I was agreeably surprised to find that it was in exactly the same condition as when we put it into the printing machine -- no dirt, no scratches, and the perforations were in perfect condition. The negative showed absolutely no signs of wear.

I write this enthusiastically, because while I had great hopes for the results from these machines, I didn't think it would be possible to go on printing indefinitely from a negative without its showing some degree of wear. This gives me absolute assurance that I will be perfectly safe in printing an entire release on these printing machines without any thought of polishing or cleaning after we get started.

I know this will be very pleasing information to Mr. Howell, because those were his claims, but until I had the actual experience, I doubted it.

Yours truly,

Superintendent of Photography

JMN/MM

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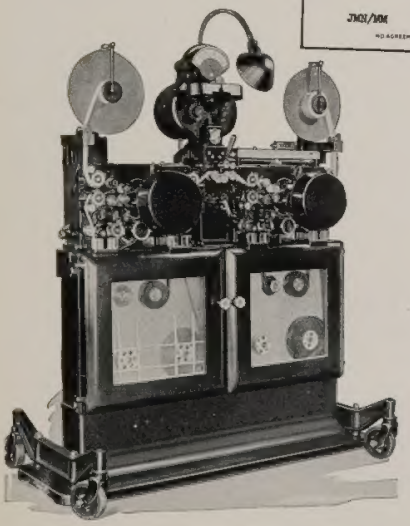

. . and this is the machine that does it

While designed for quantity production, the B & H Production Printer gives vastly finer control of print density and quality than has heretofore been possible. Sound and picture are printed at one operation under fully automatic interlocking control. The machines are ruggedly built, yet constructed to a precision of adjustment equal to that of a fine watch. Write today for details.

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is extremely compact, and self contained. Polished hinged cover serves as handle.
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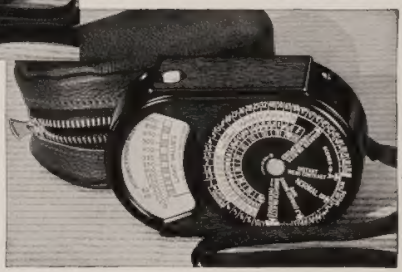

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For the still or miniature enthusiast, even though they use a movie camera, the Weston Universal Model 617 fills every need. This small, compact meter operates perfectly for any kind of camera, film and light condition. It not only assures perfect exposures on every shot, but it enables the photographer to predetermine the density of the finished negative.

See Weston Exposure Meters at leading dealers today, before you make any gift selection. Finished in keeping with the finest photographic equipment, yet built to give life-time service, a Weston Meter will be your gift-choice this Christmas. . . . Weston Electrical Instrument Corp., 598 Frelinghuysen Avenue, Newark, N. J.

Results like these are assured when Weston Exposure Meters are used, even when the pictures are taken under adverse light conditions. The meter never guesses, but gives the correct exposure facts, every time.

WESTON *Exposure Meters*

Society Solidifies Craft

DURING its fourteen years of existence the American Society of Cinematographers has, perhaps, gone through no greater constructive year than the one about to close its calendar career.

It has found, by its efforts, a solidifying of the men who comprise its membership; it welcomed several hundred new members who recognized in its constructive work, during the restless days of the industry, a force that founded its efforts on principles which have always been the ideals of the cinematographer.

By reason of its negotiation of a contract with the producers it continued an orderly condition in the industry which had threatened to break its bonds and undo the efforts of many years to bring the cinematographer to his present status.

While sincere gratitude is felt to the Society for this one action, still its present negotiations for new contractual relations with the producer promise a much greater freedom for the cameraman, finer and greater benefits for the craft than it has ever before enjoyed.

While it does not promise the millenium, still the work of the committee on code and contract relations has, through its efforts during the past three months, brought negotiations to such a point and consolidated ideas to such an extent that it is anticipated the next thirty days will give the cinematographer one of the most equitable working arrangements with the studios that has been his privilege during the many years of the existence of this great industry.

Gentlemanly and amicable meetings are being conducted by the two bodies, according to reports of the committee, in an effort to bring about a relationship which will be equitable and fair to all concerned.

During the turmoil of the N.R.A. negotiations, while the Society assumed its duties in relation to its membership in these activities, still these efforts were not of the destructive type; they were not selfish nor were they unfair to any of the elements concerned. Through their representatives, they gave their best advice, gave true interpretations of the cameraman's viewpoint and a comprehensive picture of conditions that surround his work in the studios. The result of this harmonious attitude on the part of the American Society of Cinematographers is too well known to repeat at this time.

Unselfishly, quietly but aggressively the committee consisting of John Arnold, Fred Jackman, George Schneiderman, Victor Milner and Arthur Miller have given over much of their time during the past several months in the negotiating of contracts with the producers. They are now bending their efforts toward the completion of the permanent contract which will not only bring newer and greater benefits to the cinematographer but will eliminate those very undesirable and much controversial phases which have been a part of past agreements.

This untiring and unselfish work is now culminating toward an understanding and agreement which will be recognized by the Cinematographic Craft as one of the greatest forward strides in the recognition of the cameramen and in granting to him the privileges and freedom that have always been his due.

It is a recognized fact by those responsible for inter-craft relations that the photographic phase of the industry is the least expensive in comparison to its importance to the industry. Statisticians have claimed that approximately one per cent of the production cost is chargeable to the cinematographer and his assistants; truly a modest amount in comparison to its importance.

With this conclusive realization it is not difficult to understand that the studios approach the committee of the American Society of Cinematographers with an open mind and with an inclination to negotiate an agreement that will be ideal so far as it is humanly possible to make such a document.

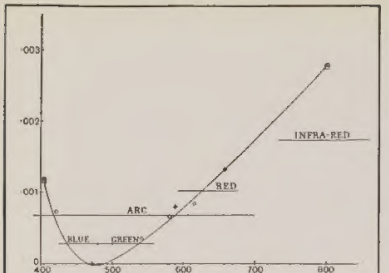


Fig. 1. Wave-lengths in $m\mu$

Photography

ALTHOUGH the beginning of the photographic investigation of the Red and Infra-Red regions of the spectrum dates back to almost half a century, it has been only in the last fifteen years that it has emerged from the research and experimental laboratory and has entered the field of practical photography.

Modern physics has shown a marked tendency to express by the term "Electromagnetic Radiations" those radiations that travel through space with the velocity of Light and according to the wave theory of propagation.

The Electro Magnetic Spectrum comprises radiations ranging from a wave length of a few tenths of a millimicron to that of several miles.

At the shorter wave length end of the Spectrum are the Gamma Rays used in Radiology and the still shorter Cosmic Rays which have been brought to public attention in latest years mainly through the investigations of Dr. Millikan of the California Institute of Technology.

At the long wave end of the Spectrum are the waves used in wireless and the still longer waves generated by rotating a coil in a magnetic field.

A very small portion of the Electromagnetic Spectrum comprises the Radiations that produce the sensation of Light and is commonly known as the Visible Spectrum. These Radiations are confined within the limits of wave lengths from 393 to 759 millimicrons, from the Oxygen A to the Cadmium K Fraunhofer lines.

Beyond the two limits of visible radiations are other invisible radiations which can be detected photographically and which are termed Ultra-Violet or Infra-Red radiation according if their wave length is shorter or longer than that of the limiting visible radiation.

The short wave portion of the invisible Spectrum that can be detected through its photochemical action extends to wave lengths as short as approximately 0.006 millimicrons (X-Rays) while the long wave portion is nowadays limited to wave lengths of approximately 1129 millimicrons, in the neighborhood of the Mercury line corresponding to the 1128.8 millimicrons wave length.

From the very inception of photography, it was recognized that the photochemical effect upon the silver halides was limited in the longer wave length end of the spectrum to little beyond the 500 millimicrons wave length and therefore the yellow radiations between 587 and 589 did not have any effect upon the light sensitive material.

It was in 1873, before the introduction of gelatine emulsions, that Vogel, while experimenting with a view to eliminate halation, mixed some dyes with the Collodion emulsion then in use and discovered that this would extend its sensitivity to the yellows. Corallin was the first dye used, but by extending his experimentation to the use of a number of dyes he proved that the emulsion was rendered sensitive to the radiations that were absorbed by the dyes and in 1875 he discovered the sensitizing properties of Cyanin which extend into the Red region of the Spectrum.

The road was open to the Science of Orthochromatics and other experimenters followed it, especially with a view to discover dyes that would have the strongest sensitizing effect together with good keeping qualities and a minimum of fogging propensities.

Gelatine emulsions made their appearance, and in 1882 Attout Tailfer introduced the use of Eosin and Erytrosin in conjunction with Ammonia which sensitized the photographic plate for the yellows and green-yellows.

Shortly afterwards, Vogel succeeded in sensitizing the emulsion for both the yellow-green and the orange-yellow regions, by mixing Quinoline-Red and Cyanin, but it was only some ten years later that an incursion was made in the Infra-Red region of the Spectrum by Higgs, who, for the scope of photographing the Solar Spectrum, used Coerulin and reached wave length 840.

It was at about this time that Eder made known the results of his investigations in the field and expressed the essential requisites and facts to support the theory of dye sensitizing confirming Vogel's assertion that the sensitizing power of a dye is stronger for the radiations that it absorbs more readily and that the stability of the dye itself has little or no influence on its sensitizing power.

Researchers were, however, confronting the fact that all dyes known at that time had a tendency to produce considerable fog and also that the plates so prepared had a very limited keeping quality, which almost confined them to the scientific and research laboratory, their commercial application being limited by the knowledge, the patience and the application of the photographer.

However, the discovery of the dyes of the isocyanine group first introduced by Miethe (Ethyl Red) and followed by the Pinachrome, Pinaverdol and Orthochrome T discovered by Konig in 1904, brought orthochromatics into the commercial realm because of the reliability of their action and of their sensitizing effect in the yellow and orange regions as well as in the green, to which color all emulsions show a definite lack of sensitivity.

Two years later in 1906, Pinacyanol, a Red sensitizer of the carbocyanine group, was introduced by Homolka and its discovery marked the advent of Panchromatic emulsions because, when mixed with a green sensitizer, it extended the sensitivity of the of the photographic plate to all the colors of the visible spectrum.

In the same year the discovery of Dicyanine permitted a definite entrance into the Infra-Red region of the spectrum since by using it in conjunction with Ammonia, it was found possible to reach a wave length of 1000 millimicrons and even the Mercury line 1014. Dicyanine did not, however, prove very satisfactory, mainly because of the poor keeping quality of the plates sensitized with it.

It was only in 1919 that Adams and Halle discovered Kriptocyanin, a dye that can be either incorporated in the

With Infra Red Radiations

by

J. A. Dubray, A. S. C.

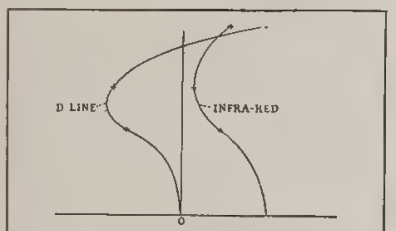


Fig. 3. Longitudinal aberration × 5

emulsion or used by bathing and which shows remarkable freedom from fog as well as good keeping qualities. Kriptocyanin has a maximum of effectiveness at wave length 770 and extends up to 800 with an unfortunate rapid falling off from this point so that it is decidedly inferior to Dicyanin at wave length 900. Finally even these limitations were offset by the discovery by Clarke in 1925 of "NEOCYANIN."

This remarkable dye sensitizes photographic emulsions with maximum effectiveness at wave length 820 and extends easily to 900 without the addition of fogging Ammonia.

With the addition of Ammonia, however, its sensitivity to Infra Red is still enhanced and with a long exposure, wave length of 1129 millimicrons has been recorded on a photographic plate, so it is possible today to produce a permanent record of Radiations which only a few years ago could not, so to speak, be captured.

The above condensed chronological data has reference to the progresses made in sensitizing photographic emulsions but it is obvious that other fields had to be explored in order to develop the practical application of the findings.

The designing of lenses to be used for infra-red photography has proven a task for the optician who was confronted with the difficulty of carrying the calculations necessary to secure the proper chromatic correction for a region of the Spectrum for which the refractive indices of optical glass are unknown.

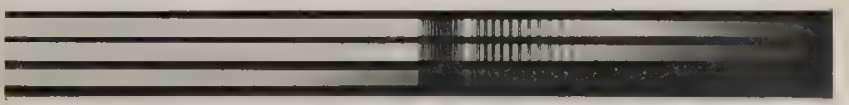
H. W. Lee of the Research Department of Taylor, Taylor and Hobson, makers of Cooke lenses, has explained the methods used for carrying this correction, in a paper published in the British Journal of Scientific Instruments (Vol. IX, No. 9, September 1932) which is here literally transcribed in almost its entirety:

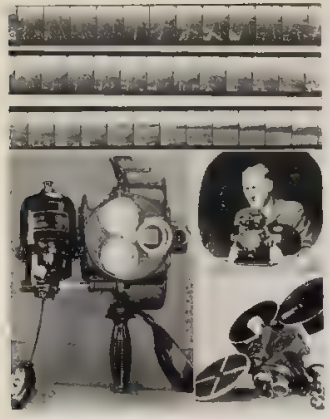
"It was soon recognized that Neocyanin sensitized plates would be valuable in photographing distant objects through our atmosphere, which scatters light of short wave length and thus produces atmospheric haze. A filter is placed in front of the lens to absorb such short waves and the photographs made by means of the long waves only. Remarkable pictures were made by Prof. Wright of Lick Observatory showing the Yosemite Valley and Mount Hamilton 120 miles away. He also photographed Mars, and it was at once apparent that existing opinions as to the absence of atmosphere on Mars must be abandoned. The method also promises scientific value in the comparison of stellar magnitudes. At present the color index is made by comparison of the photographic magnitude (by violet light) with the visual magnitude. It is now possible to compare with the magnitude at 8000A and get a better classification. Capt. Stevens (Phot. Journal, 71, 1931, 278), of the U. S. Army Air Corps has also secured some remarkable results from an aeroplane. In one photograph the horizon was so distant that the curvature of the earth could be demonstrated and actually calculated with fair accuracy.

In correcting his lens for infra-red photography, the optician is at the disadvantage that his knowledge of the optical properties of his material is derived entirely from visual measurements. It is, of course, no new difficulty, as the same trouble confronted him in the correction for ultra-violet photography. He has to meet the difficulty by cut-and-trial methods guided by a mixture of instinct, empiricism and scientific control. One of the most useful empiric guides, E.g., H. W. Lee, Trans. Opt. Soc. 28, 1926-7, 161-71), is the Hartmann dispersion formula, which has been found to give sufficiently accurate extrapolation for short distances beyond the visible spectrum. It is well known that glasses of different types give different proportional dispersions throughout the spectrum, e.g. the ratio of the dispersions F–G′ C—F is greater for flint glasses than for crowns. If all glasses had equal proportional dispersions there would be no need for an exact knowledge of the refractive index of a glass for each region of the spectrum, because if a lens system were achromatized for two points of the spectrum it would be achromatized throughout. There are a few glasses which approach this condition of equal partial dispersion most nearly and from them are constructed the so called Apochromatic Process Lenses. Such lenses have a smaller "secondary spectrum" than those made with "normal" glasses. A lens of this type is used by The Times (London) in their current

(Continued on Page 337)

The Red region of the Solar Spectrum photographed in 1926 by Dr. Babcock of Mount Wilson Observatory, with Kriptocyanin sensitized plate.





At top Fig. 4. Typical strips printed from a continuous roll of 35mm mapping film made with mapping Eyemo. Lower left Fig. 2 showing mechanism for changing over from movie camera to mapping camera. Motor operates from 10 volt plane generator. Center right, mapping Eyemo mounted in hose of plane for reconnaissance mapping work. Lower right Fig. 3, close up showing rollers in magazines to allow camera to be used on its side. "In operation door side of magazine is down."

Combination Movie-Mapping Camera

by

R. Fawn Mitchell*

PROBABLY every reader of the American Cinematographer made a special point of seeing the wonderful pictures taken by Admiral Byrd on his first Antarctic Expedition—at least you all know the story. All the people with whom I have discussed the Byrd pictures were impressed by the episode of cameras versus food—should they jettison the cameras to clear that ridge or should they take the chance of disaster and dump the food instead? As you all know, the pictures tell the story.

I had a couple of long talks with Sir Hubert Wilkins when he was seeking equipment for the Ellsworth Antarctic Expedition and it was quickly evident that their expedition was not at all keen about having to make such a decision. Furthermore, they had a firm desire to **map** the region they traversed—not to photograph only the more spectacular terrain.

The problem then resolved itself into securing a mapping camera which would make a continuous series of overlapping pictures from which a regular aerial map could be made. The camera had to have enough capacity to map the cross-polar dash, lasting about nine hours, at the same time it had to be as light as possible.

Commander Wilkins felt that the use of 35mm motion picture film was the only practical solution, as the amount of film alone required for mapping with a regular aerial camera, apart from the weight of the camera and the bulk of film, precluded their use.

The suggestion, therefore, was that the EYEMO camera, equipped with a 400 ft. magazine, be mounted on the wing (or other suitable out of the way location), and set to take single frames at regular intervals. However, weight is such an important item that it was desired to use the EYEMO in the regular manner for ordinary movie work also. This complicated the problem seriously and, first, it was doubtful whether it could be done. Fortunately, several factors could be standardized and therefore simplified so that the combination could be worked out satisfactorily.

First of all, Sir Hubert called attention to a remarkable fact, namely, that the upper strata of air in the Antarctic are comparatively warm—above zero, also, he stated that the equipment would not be used in extremely cold weather. This permitted the incorporation of a second shutter and its associated mechanism in the head of the camera, with provision for throwing the second shutter in and out of operation at will. For instance, the camera could be used as a mapping camera for a time and then as a movie camera, and then set back again as a mapping camera. However, for the main dash across the Pole and back it is expected to be used solely as a mapping camera.

As mentioned above, the flight across the Pole is expected to take about nine hours, flying at an average height of about 2000 feet at a speed of approximately 150 miles per hour.

Single frames had to be taken at intervals which would give at least a 10 percent overlap of one frame to the next at this speed and height, using a 2-inch lens on the camera, and, setting the camera on its side, it was found desirable to make one frame every six seconds or so. Setting the camera on its side placed the short height of the frame across the line of flight and the wider width of the frame along the line of flight. Six second intervals under these conditions meant that the camera could be set at an angle of approximately 40 or 45 degrees to the horizon and obtain a satisfactory overlap (see Fig. 1 and Fig. 5). For convenience of mechanical construction, a fixed interval of six seconds and a fixed exposure of 1/100 second were decided on.

The arrangement described will enable the single mapping frames to be taken over practically the entire dash without reloading—nearly seven hours of the nine-hour dash. These alternatives are available. Either a preliminary test flight can (and probably will) be made for the first hour or two of the route up to and including some easily recognizable landmark. Then on the main mapping

* Manager, Technical Service, Bell & Howell Company, Chicago

Continued on Page 334

Systematized Miniature Development

by

Clarence Slifer, A. S. C.

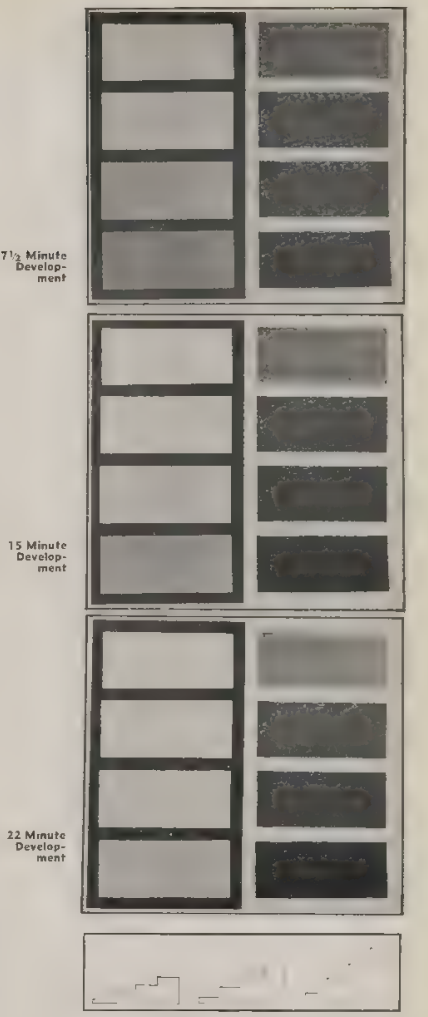
THERE is one period of time in the development of film that may be considered as normal. This period is when the gradations in the negative are in their best proper relationship (all things considered—exposure, color rendering, etc.) to the photographed subject. The contrast in the negative is neither diminished or exaggerated as it would have been had the negative been developed for less or for longer than this normal time.

It is quite evident that with a roll of miniature negatives made under varying conditions and exposures, it would be impossible to develop this roll to exactly suit each individual exposure, as was done with larger negatives when they were developed by inspection. So, by developing the miniature roll for the normal time we treat each exposure alike, favoring or slighting none and in this manner we obtain the highest percentage of good printable negatives.

But now can we tell when we have developed our films for the normal time, if we cannot develop them by inspection? Are we not comparable to a blind man groping around in the dark? Exactly, and like a blind man who faithfully depends upon a dog to guide him, we can depend upon a strip of film of graduated densities to guide us.

Our next step, then, is to secure some undeveloped film with a graduated scale of exposures upon it. A sensitometric strip. As most of us do not have access to a sensitometer it will be necessary for us to make our own strips. Happily for our purpose this is a very simple job. All that is necessary is that we set up our miniature camera and make a number of like exposures of a graduated chart. A graduated chart may be purchased from the Eastman Kodak Company for a few cents. It is part of the guide that they make for three color photography. If none is available, it is an easy matter to make one on soft enlarging paper, so exposing the paper, that the scale ranges from white to black, with each step having double the exposure of the preceding step. On the black end of the scale I would suggest that you add a piece of black velvet. This gives you an absolute black.

Now for photographing the scale. The scale illustrated was copied by a Leica camera, equipped with a 90mm Elmar lens. Two photo-flood bulbs in reflectors, were used for illumination and the exposure was 1/20th of a second, on E. K. Background Panotomic negative. I would suggest that you make your gamma or graduated strip on the same type of film that you most generally use. However, positive film may be used, if you always use the same kind of developer. I determined this exposure by previously making several trial exposures and then developing the roll in D-76 for 15 minutes. This was the average time that I had been developing my negatives. Then I exposed several Leica magazines at the determined exposure. This gave me a number of feet of undeveloped graduated negatives, hereafter referred to as gamma strips.



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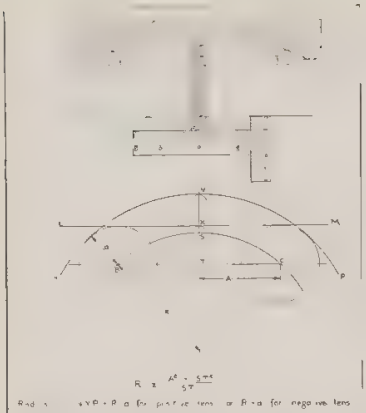
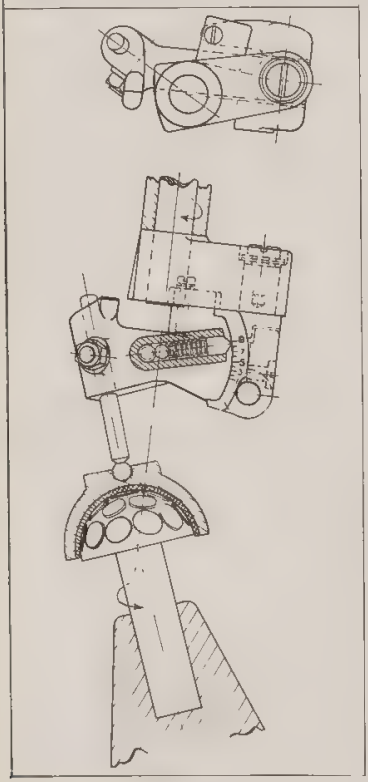


At Top Fig. 22
At Bottom Fig. 23



Mechanical

THE processes of smooth grinding and polishing are performed by means of part-spherical laps of the general forms shown in Fig. 19, and here we touch the reason why lens surfaces are generally of spherical form. The only abrading means by which the requisite regularity of lens surface can readily be produced is a lap which makes complete surface contact with the lens at all times, and not merely line or point contact. And the only possible form of lap and lens which can under these conditions be moved in various directions relatively, to abrade one another, is the spherical form.

The primitive way of using such a lap is shown in Fig. 20. Here the work is mounted at elbow level on the top of a post fixed to the floor, the lap is provided with a central knob, and the craftsman, with a thumb and finger embracing the knob and his two hands putting pressure on the lap, moves the lap to and fro, more or less radially over the work, and at the same time walks steadily round the post in order to distribute the rubbing equally round the lens surface. The orbit of the tool is thus roughly epicycloidal. At intervals he moves the lap a little round under his hands so as to distribute the rubbing evenly upon the lap. To form a lens accurately within one or two wavelengths of light by these primitive means demands a length of experience and a degree of skill of which the craftsman is justly very proud.

It was to avoid the heavy labor of moving the tools for making large telescope objectives that machinery was first applied to this operation. The glass disk was attached to the upper end of a vertical shaft and slowly rotated. Two cranks were used to move the upper tool, and their connecting-rods were pivoted in common to the centre of the tool and disposed at right-angles to one another. The crank-shafts were belted together so that they seldom returned to the same phase, and thus the orbit of the tool changed continuously between a straight line and a circle, and so back again.

Over forty years ago I experimented by rubbing together flat disks of Bath brick (which quickly gave results), to determine whether this constant change in the quasi epicycloidal motion between tool and work was really necessary. I found it to be useless, nevertheless for thirty years lens-working machinery with the two cranks continued to be made, although the operators had acquired the habit of setting one crank-pin concentric to its shaft so that it acted as a fixed pivot and its connecting-rod as a mere link constraining the tool to move in the arc of a circle. But the fixed pin was not permitted to be passive, it continued to be rotated!

In machines of this kind the function of rotation of the work disk is to distribute the abrasion equally round the work, and the main function of the radial motion of the tool is to effect the rubbing, the tool is pivoted to the connecting rod, and not fixed to it, so as to permit the tool to be slowly rotated by the work and thereby equalize the rubbing round the tool surface.

If a circular lapping tool be applied in this way to abrade a circular disk, and the lap and disk have the same diameter,

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[1] Reprint of address delivered to The Institution of Mechanical Engineers.

Engineering Applied to Lenses

by **William Taylor, O. B. E.**[1]

PART III

the effects gradually to change the curvature of the two contact surfaces, the lower member being over-lapped toward its margins, and the upper member towards its centre.

Thus, for example, if we start with plane surfaces, the lower member will gradually become convex and the upper one concave, and this change will progress indefinitely. To secure stability of curvature, obviously the upper member (the lap in the case we are considering) must be smaller than the lower member; but how much smaller should it be? If only a little smaller, then the orbit of the tool's motion must be small and the rate of abrasion small. If very much smaller, then the tool's orbit will be greater, but its control of the regularity of curvature of the work surface will be impaired.

This problem was solved by means of the Bath brick disks. The diameter of the upper member was varied step by step. At each step the orbit of motion was adjusted until stability of surface curvature was secured, and then the detritus removed by rubbing for a fixed time was weighed. Thus it was proved that the optimum effect of abrasion and stability of curvature were obtained when the ratio of diameter of upper to lower members is about 5:6.

When glass has been sufficiently smoothed with fine abrasive and a metal lap, it is polished. Plate glass and spectacle lenses are commonly polished with rouge and water on felt-coated tools, but this would be useless for photographic lenses. These are polished with laps faced with pitch or waxes, extremely viscous solids which at any instant behave as though rigid but which nevertheless conform slowly but accurately to the surface of the work. Experiments in the Leicester works laboratory have shown that the layer of glass removed in polishing a lens surface by these means is only about six wavelengths in thickness.

The means by which every surface of every lens is tested for curvature and regularity of form is illustrated in Fig. 21. A very accurate counterpart of the desired lens surface is worked in a disk, generally of glass, and this is placed in contact with the lens surface, and the contact is viewed by reflection in order to observe the so called Newton's rings formed by interference of the light waves reflected from the two surfaces. If these surfaces conform only approximately they will show a series of concentric rings of color, a fresh ring wherever the separation of the surfaces changes by half a wavelength.

If the surface under test is not truly spherical this will be revealed by the irregular spacing of the rings. If it is not a surface of revolution, the rings will be deformed. If there is only one ring, the surface conforms to the gauge within half a wavelength. If there is one uniform color throughout the contact the conformity is of the order approximating one millionth of an inch.

If the test gauge be defective as to its regularity of curvature, this will be revealed by moving the gauge on the lens surface, for if the defect follows the gauge it is a defect in the gauge.

The radius of curvature of any surface is measured by means of a spherometer, of which a section is shown in Fig. 22, together with a diagram of its geometry and its equation. The contact points of this spherometer are standard steel balls and its construction such as to facilitate accurate calibration.

One of the difficulties encountered with work of this accuracy is that of holding anything whatever without distorting it. No kind of mechanical holder or chuck is per-

Continued on Page 331

At top Fig. 25. Upper center left Fig. 19 showing Part-spherical Lap. Under center right Fig. 21—Lens Testing. Lower center left Fig. 24. Lower center right Fig. 20. Bottom Fig. 26.

[1] F. W. Preston, Trans. Optical Soc. 1922-3, vol. xxiv. See also Lord Rayleigh's collected works.

PHOTOGRAPHY of the MONTH

"THE POWER AND THE GLORY"

Jesse L. Lasky Fox Production

photographed by **James Wong Howe, A.S.C.**

Here is as impressive an example of the value of Cinematography as has been seen in many a month. The production itself is unusual in many ways—especially in the reversed chronology of its plot construction—and impressive in every phase. The day critics have already praised William K. Howard's direction, and Spencer Tracy's outstanding performance, but to the cinematographer a major part of the credit must go to Cinematographer Howe. Viewed strictly as photography, his work is excellent, beautifully composed and lit, technically adhering to the finest standards. But it is as Dramatic Cinematography that The Power and the Glory's most arresting the mood and feeling with which Mr. Howe has invested this production has rarely been equalled. Most important of all is the tangible aid which his lighting has given to the characterizations—especially that of Spencer Tracy. Without detracting an iota from Tracy's well-deserved laurels, one cannot help observing that a great deal of the credibility and force of the character comes from Howe's photographic treatment. From this viewpoint alone, the film merits the careful study of everyone in the industry.

"NIGHT FLIGHT"

Metro-Goldwyn-Mayer Production

photographed by **Oliver T. Marsh, A.S.C.**

aerial photography by **Elmer G. Dyer, A.S.C.,** and **Charles A. Marshall, A.S.C.**

Technically and artistically this is one of the most outstanding aerial films ever produced, and it is an absolute masterpiece of Aerial Cinematography—thanks to the efforts of Cinematographers Dyer and Marshall. The dramatic portions of the film are—as could be expected of any production photographed by Oliver Marsh, A.S.C.—of the highest quality, but they are vastly overshadowed by the aerial sequences. The pictorial beauty of some of these aerial scenes has never been approached, while technically they are equally outstanding, not alone for the many difficulties which had to be overcome to secure them, but also as some of them represent the first use of infra-red sensitive film for commercial production. These include the aerial night effect scenes, which are the first of their kind. The process work is also outstanding, thanks to the efforts of Len Smith, A.S.C., and Harold Marzorati, A.S.C.

"ONLY YESTERDAY"

Universal Production

photographed by **Merritt B. Gerstad, A.S.C.**

You can't envy the director or the cinematographer who is faced with such an assignment as this, but you can—and in this instance, must heartily applaud them when their efforts are so successful as in "Only Yesterday." The cast contains over 90 principals, most of whom would have enjoyed starring in many lesser films, and the story covers a wide range of action and moods. The result is eminently a feather in Cinematographer Gerstad's cap, for the photographic quality is unusually high, and the production set off to superb advantage.

One must commend Director Stahl upon his excellent directorial taste, to say nothing of ability in handling so difficult a production. The Art-Director and Costumers likewise deserve credit, but the largest orchid undoubtedly belongs to Cinematographer Gerstad, who has handled a difficult assignment in the face of unusual handicaps, and succeeded outstandingly.

"TOO MUCH HARMONY"

Paramount Production

photographed by **Theodor Sparkuhl, A.S.C.**

This production—an unpretentious though enjoyable little musical—is hardly one to bring to Cinematographer Sparkuhl the opportunities he deserves. It is excellently handled, nevertheless, with flashes of real cinematic originality here and there, especially on one scene in which Jack Oakie plays his most dramatic action entirely hidden in a deep shadow.

"MEET THE BARON"

Metro-Goldwyn-Mayer Production

photographed by **Allen Seigler, A.S.C.**

For some reason or other, when a studio attempts to make a picture starring a radio celebrity, it is often inclined to carelessness regarding the photography—reasoning, perhaps, that the voice is more important than the picture. In this instance, however, there is no such shortcoming for Al Seiger, A.S.C., was assigned to the picture, and he has given radio's Baron Munchausen such a favorable camera treatment as is often missing from more important productions. In every way, Seiger's camerawork is of the highest class—radiating a quality all too seldom found in musical films. Walter Lang's direction, too, is noteworthy; from the few examples of his work we have seen, we will venture to state that he is one of the few directors who really understand the nature of the sound film. His understanding of rhythm and the use of sound and silence is undoubtedly the best on this side of the Atlantic. He might, however, have spared us the excessive use of Optical "Wipes" in the early sequences, even though Irving Ries, A.S.C., accomplished them expertly.

"THE INVISIBLE MAN"

Universal Production

photographed by **Arthur Edeson, A.S.C.**

special effects by **John Fulton.**

This production is primarily an achievement in special process photography, and is as such worthy of the greatest study, a goodly proportion of the film's footage comprises Special Effects work of the most difficult type, I wager there are many professionals who would like to know how

(Continued on Page 342)

Greeted With
APPLAUSE

EASTMAN Background Negative is winning wide acclaim among the many producers and cameramen who have already discovered its possibilities. Its remarkably fine grain meets the prime requirement of background shots that are to be projected and rephotographed. Other qualities . . . particularly a surprising degree of speed . . . give it a potential versatility that may well lead to finer photography in other directions. Eastman Kodak Company, Rochester, N. Y. (J. E. Brulatour, Inc., Distributors, New York, Chicago, Hollywood.)

EASTMAN
Background Negative

WHEELS OF INDUSTRY

35mm for Rolleflex

• According to an announcement from Burleigh Brooks, American distributor of the popular Rolleflex camera, there is now available for that camera an attachment that makes it possible to use 35mm film.

This attachment consists of only a few parts: a new back that hinges to the back of the camera in the same manner as the regular back, a film guide that snaps in place and a mask to fit in the focusing ground glass to show the correct size.

The film cartridge holds sufficient 35mm motion picture film to make thirty six exposures, double size frames and is loaded much in the same manner as the regular film. The film counter located on the back of the camera is then set at No. 1 and the transport of the film is effected by pressing down on the lever on the side as with the ordinary film. The perforations of the film as it passes through the camera operate the film counter. There is also a device to cut the film and remove it for developing before the film is fully exposed.

Rolling Tripod

• Andre Debrie, Inc., announces a rolling tripod. This rolling tripod is said to be an improvement on the so-called "dollies" since it can be operated by the cameraman himself, steers easily like an automobile, raises and lowers and is so constructed that the legs are not in the way of the cameraman or his assistant.

16mm Film Laboratory

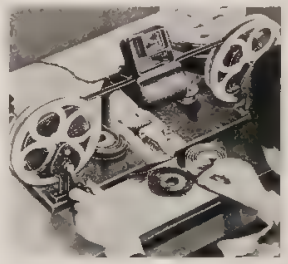
• Sunny Schick, motion picture equipment broker and owner of the Atlas Film Company, announces the opening of their new DuPont Film Laboratories which will occupy new quarters in their newly constructed building at 401 W. Washington Boulevard, Fort Wayne, Indiana.

The plant is of the latest type in construction and its capacity is the developing of 500 rolls of movie film per month. The plant is fully equipped to handle reversing process of film as well as duplicate printing and enlarging. Also the development of Leica and Contax strip film and the printing of same.

Mr. R. D. Kimmel, formerly of Des Moines, Iowa, well known as a film specialist, is in charge of the Atlas Film Company plant as supervisor.

16mm Direct Viewer

• The Bell & Howell Film Editor has been improved by the application of a new picture viewing unit, the Bell & Howell Direct Viewer.



With this new unit, the picture image is cast upon a translucent glass screen, 1½x1-16 inches in size, where it is visible from a normal sitting position. The picture is studied with all the comfort and freedom from strain that characterize actual movie projection.

16mm film is drawn through a scratch proof channel in the new Direct Viewer, just as in the former viewing device. The channel has upper and lower plates which are hinged to open wide for inserting and removing film. Another hinge permits the entire unit to be swung back behind the path of the film when rewinding.

New Leica Lenses

• E. Leitz, Inc., announces a new fifty millimeter lens, the Summar F.2, which possesses important characteristics. This lens, due to a revolutionary optical design, produces needlesharp crispness, even when used at its widest aperture. Because of this, it is not to be confused with so-called "speed lenses," according to the announcement, which sacrifice sharpness and definition for the sake of speed. It may therefore be used as an "all-purpose" lens on the Leica. When stopped down, its sharpness and depth remain normal as is customary with the more normal lenses.

A new 35mm Hektor lens is announced with the Summar lens. This lens is identical to the Elmar lens of the same speed and focal length, but its lens design is quite different. It possesses a remarkable flatness of field and color correction, hence is a valuable lens for those who require these qualities.

Both the new Summar and Hektor lenses may be obtained in the regular or chromium mountings. The Summar comes in two styles, one a fixed or rigid mounting, the other in collapsible form like the other 50mm Leica objectives.

Exposure Calculator

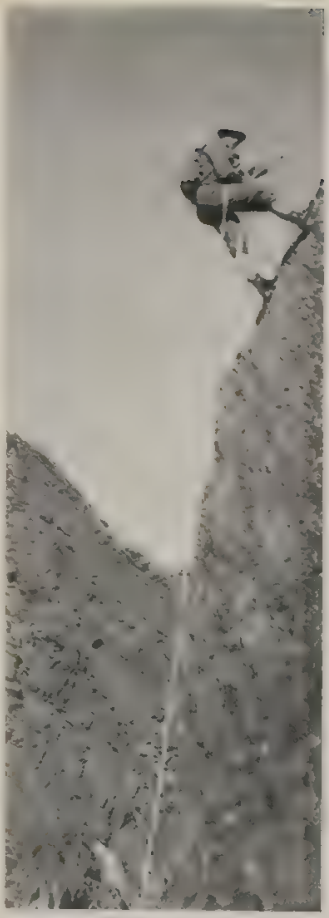
• Burroughs Wellcome & Company announce the publication of their 1934 Photographic Exposure Calculator and Handbook. This little book with its many formulas and authentic photographic information together with its method of calculating exposure has been the guide for many photographers during the many years it has been published.

Its novel exposure calculator based upon latitude in which the picture is being taken and the speeds of the various types of film both motion picture and still has always been a very fine feature of this little book.

Industrial Pictures

• According to an announcement from Castle Films, sound-on-film motion pictures for business use in the United States and Canada will henceforth be made exclusively with RCA-Victor Photophone equipment. A contract just signed by Castle Films gives this company full rights to Photophone facilities for its nation-wide work in the business motion picture field.

In addition to the RCA-Victor Photophone recording equipment, another RCA-Victor development, 16mm sound-on-film, is being employed by Castle Films. The perfection of sound pictures on 16mm film makes this medium both practical and economical for advertising and sales promotion work. With the new film, showings can be made to large audiences with equipment that can be packed in two cases that one man can handle.



Cover photo by Phil Chancellor, A.S.C.

AMATEUR SECTION

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• PROFESSIONAL Criticism of the Amateur picture is a part of the service offered by the AMERICAN CINEMATOGRAPHER. Many are not aware of this. Hundreds of pictures have been reviewed this past year by members of the American Society of Cinematographers for the Amateur.

Next Month . . .

• Lack of space forced us to leave out the story on Microscopic Kodachrome. This is a rather big story, but we promise it definitely for next month.

• There will be more about interior lighting. Next month's article will treat on lighting the set. The basic principles of lighting for motion picture making.

• We have an interesting story on hunting with the camera that contains a few hints on just how the Indians stalk some of their elusive prey. You won't want it.

• Of course there will be other stories, both technical and otherwise that you will find helpful in your hobby.

GIFTS TO DELIGHT Every MOVIE MAKER!!

TO BRING unbounded delight to any movie maker at Christmastide, give some item of the World's Finest 16 mm equipment or accessories . . . . and "The World's Finest," of course, means VICTOR!

Such a gift indicates thought and foresight on the part of the giver . . . . a desire to give future as well as immediate enjoyment. And the VICTOR trade-mark on your gift will identify it as the ciné gift supreme! Ask Your Dealer

Most sensational of all Camera Values is the *VICTOR 3* at $67.50 with F2.9 lens. Five operating speeds and many other features. Finished in gold flecked brown with satin black and chromium trim. Available with Kodacolor.

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The handy *VICTOR POCKET TITLER* permits making titles anywhere right in between shots. Models for Victor and Filmo Cameras and for 1 in. and 20 mm lenses. Only $6.75.

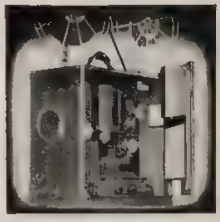
The CAMACASE is a convenient accessory desired by all movie enthusiasts. Looks like a cane, serves as a tripod for any camera with standard tripod socket $9.75

Most efficient of all 16 mm projectors is the *VICTOR MASTER* . . . . . Priced at $123.50 and $137.00. Illustrated with $10.00 1600 foot attachment. (Kodacolor, $28.00 extra if desired.)

What a gift for family, church, school, orphanage or scout troop . . . . NOT Talking Motion Picture equipment! The *16 mm ANIMATOPHONE* is priced at $395 and $510.

The *VICTOR* Simplex *FILM CLEANER* is a necessity if films are to be properly preserved. Removes dirt and keeps films conditioned. $8.50.

Every Movie Maker wants more lenses . . . . SPEED, WIDE ANGLE or TELEPHOTO. *DALLMEYER LENSES*, unsurpassed in quality, are most attractively priced. 1 inch, F1.5—$55.00, 15mm F2.9—$30.00, 2 inch F2.9—$35.00, 3 inch, F2.9—$40.00. Ask for complete list.



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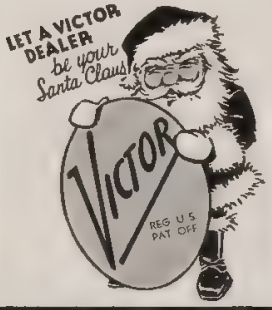


WORLD'S FINEST 16m/m MOTION PICTURE EQUIPMENT

8 Mm. Picture Ranks High in 1933 Competition

WHAT will possibly be considered an unusual achievement and a signal recognition is the stride made by 8mm film and the position it assumed in the 1933 AMERICAN CINEMATOGRAPHER Annual Amateur Competition

Making the classifications as few as necessary but at the same time giving all entrants full recognition of their work both as to nature and quality, the committee confined the pictures offered to five classifications with an additional recognition for Photography

The groups as they were finally divided included Travel, Home Movie, Educational, Scenario and Kodacolor

There was no discrimination in this contest as to the width of film used They were all placed into their respective classes regardless of their size, so that 8 and 9½mm competed with 16mm

R B Clardy's 8mm picture "Cattle Country" in 200 feet showed a consistency of photography, a fine understanding of composition and a smoothness of continuity that might have done justice to an experienced professional Especially worthy of comment were his titles Because of his outstanding work Clardy was given the gold medal for Scenario Pictures as well as the gold medal for Photography

In some of the classifications only one medal was awarded, as it was felt by the committee that the others in that classification just missed a second award classification

By the method of judging, of considering the picture from the photographic, directing, technique story, titling, editing, acting and entertainment standpoint, these pictures sometimes fell a point or two below the lowest average allowed for a medal

To secure a gold medal a picture must be above the 85% mark To secure a silver medal it must be above a 70% mark While some almost reached this mark, unfortunately some phase of their work brought them just below the allowable figure

It was felt by the committee by keeping these percentages reasonably high the recognition would be more highly appreciated and that the contest would not resolve itself into a recognition of the pictures submitted regardless of their quality, but judging them in comparison to each other

While the percentages are not high many would have reached the goal of silver medal and others would have outstripped those who were awarded gold medals if they had been more careful in their editing and especially in eliminating poorly photographed scenes Some who had very fine pictures on the average submitted them with too much superfluous and repetitive scenes Shots that did not help the picture or add to its interest as they were either similar to those already shown or a repetition of earlier scenes in the picture

While it is recognized that they are personal records and a record of some special occasion or event still it was very evident that they lacked that certain zest that wards off the proverbial yawns

Three medals will go out of the United States One goes to Japan, another to Great Britain and the third to Canada Ten medals in all were awarded, six gold and four silver

We feel that we must comment further on those given awards "Rice" a three reel subject in the educational class entered by F C Ellis of Yokohama, Japan, demonstrated a fine appreciation of production and photographic values as well as how to combine it so as to make entertainment Many were of the opinion that this picture, if it were in 35mm, would be worthy of professional theatre presentation

Ruth Stuart's Travel picture, "Egypt and Back With Imperial Airways" was not only a fine example of consistent photography but also showed a keen knowledge of editing and cutting that set the picture breeze along in an entertaining fashion

"Life," by H B Hutchings, given the highest recognition for Home Movies is the sort of picture that the 16mm camera was made for It is a day in his son's life and con-

Continued on Page 342

MEDAL WINNERS

GOLD MEDAL for Travel . . . Ruth Stuart, Manchester, England, for "Egypt and Back With Imperial Airways" 1 reel

GOLD MEDAL for Home Movie . . . H B. Hutchings, Kansas City, Mo., for "Life." 1 reel.

GOLD MEDAL for Educational . . . F. C. Ellis, Yokohama, Japan, for "Rice." 3 reels.

GOLD MEDAL for Scenario . . . R. B Clardy, Los Angeles, for "Cattle Country." 8mm. 1 reel.

GOLD MEDAL for Kodacolor . . H. W Voss, Fort Myers, Fla. "Gold Diggers." 1 reel.

GOLD MEDAL for Photography . . . R. B. Clardy, Los Angeles, for "Cattle Countr."

SILVER MEDAL for Travel . . . Leslie P. Thatcher, Toronto, Canada, for "Mighty Niagara." 1 reel.

SILVER MEDAL for Home Movie . . . W. J. Seeman, Los Angeles, Calif., for "Prairie Schooner." 2 reels.

SILVER MEDAL for Educational . . Dr. S. H. McAfee, New Orleans, La., for "Partial Denture" 1 reel.

SILVER MEDAL for Photography . . . Charles and Robert Coles, New York, N. Y., for "Cascade and World's Fair" 1 reel.

Mechanics.

Upper left Fig. 2. Upper right Fig. 6. Bottom is Fig. 8. On the left the title card drawn in negative and on the right the screen result

TITLES seem to be the bug-a-boo of amateur filmers. No part of his work more proudly proclaims his amateur standing. An old proverb opines that a thing is worth doing well, if worth doing at all. I think this explains the lack of quality in amateur titles. Too few amateurs are willing to give titles the care their proper manufacture entails. Titles are part of the picture, capable of making or marring the production. They cannot be successfully slapped in at the last minute, hastily scribbled, or even filmed terribly inadequate. They require from first to last the keenest concentration of the maker. Much preparation is necessary before even a frame is exposed.

A title stand of rigid construction is required for every thing but the most commonplace efforts. My stand (Figure 1) is made of heavy 4 x 4's dressed and shaped to hold a drawing board to carry the title to be filmed, and with the camera, a Victor, held in rigid clocked position centered above the title. The camera is actuated by a handle applied at convenient height at the right of the operator. A Veeder counter is attached to the handle in such manner that each turn of the handle, for exposure of a single frame of film, also actuates the counter. In this way titles can be accurately timed and double exposure, or other trick effects precisely placed. The handle will turn the camera either forward or backward for fades, wipe offs, or other trick animations. Through a shaft running up one side of the 4 x 4, and with a universal joint, the handle is connected to the camera. This is the alpha and omega of animation—rigidity of position and ability to expose a single frame at a time. A means of visual focusing is provided, although all layouts are one standard size, and lenses are set to a previously determined distance and stop.

Obviously the simplest kind of job is the straight unanimated title, and needs no further explanation. Three eight frames per second, button on all standard 16mm cameras, gives a comparable exposure. But say we wish to lap dissolve one title to another.

There are three methods of making a fade in the camera: 1 manipulation of the shutter, 2 exterior fading glass, or similar gadget, and 3 manipulation of the diaphram of the lens. The latter we may safely disregard as impractical and very doubtful, the former is restricted to those fortunate few who have the new Cine Kodak Special. So we must make the most of what is left, the fading glass, or some similar exterior attachment.

Beneath my camera I have constructed a shelf (Figure 2), along which it is possible to slide the fading glass—a groove at top and bottom of glass would work equally as well were the camera mounted in a horizontal position. By marking on the glass and shelf the locations of no exposure and full exposure it is easy to calculate a fade of any duration of time. Be sure you understand the principle of a lap dissolve. Each frame should have 100 percent exposure (see Figures 3 and 4). After dissolving out it is better to turn back several frames farther than the dissolve to insure a smoother lap. A camera that will permit the rewinding of already exposed portions of the film is a necessary adjunct to a good lap-dissolve or wipe-off. It seems almost impossible to remove the film from the camera to rewind in a dark room without scratching the emulsion so badly that the effect were better never attempted.

The wipe-off can be accomplished in a manner very similar to the fade. Some thing must mask out one third while the other is being exposed. I have used a section of a Goerz mask box and its attachment. Hanging this below the shelf holding the fading glass (Figure 2) it serves the additional purpose of being an ideal lens hood. A wipe off cannot be secured by any manipulation of the camera save that of rewinding the film for the second exposure. The actual wipe off is outside of the camera and is simply a masking attachment as explained above. By examination the exact points where the mask starts wiping and ends are determined. The space between is divided into as many units as we wish to have frames in the actual wipe-off animation. Starting, then, with the first copy, expose one frame for each position until the entire expanse has been masked off. Then while the lens is still covered, turn back the camera the same number of frames, adding one or two so the copy doing the actual wiping will slightly overlap the copy being wiped off. Then reverse the action, this time uncovering the lens so that the second copy photographs in the space masked out in the first operation, and the mask covers the part of each frame already exposed. The wipe-off should be feather edged, an effect much more to be desired than a straight hard line. Figure 5 demonstrates a wipe off of about one and one-half seconds' duration. The wipe off can be made diagonally—up or down—or from side to side. It can be fanned, or opened from the center or vice-versa. A whole bag of tricks yet easily accomplished with a black mask and a slotted holder.

Another interesting effect is the creeper, or rolling title. While the copy can usually be divided and lap dissolved together, nevertheless there are times when the creeper is worth all the bother its true animation involves. I secured a round fiber cylinder into which I fitted wooden ends. Hanging this on a shaft beneath a hole in the table top provides an ideal out-of-the-way position, easily driven by a phonograph motor so geared that one turn of the handle (attached where it can be manipulated with ease) moves a point on the cylinder surface one thirty second of an inch. See Figure 6. A mathematical calculation therefore determines the length of the creeper, which can be either photographed with the stop action or continuously. In my estimation a creeper should come out of nothing and go the same place—not slide out of the bottom and disappear at the top frame line. A curved surface to bear the copy provides a perspective approach for the lettering. Then in addition a vignette is necessary at the top and bottom. See Figure 7 for a sample rolling title properly vignetted.

# of 16mm. Titles

by

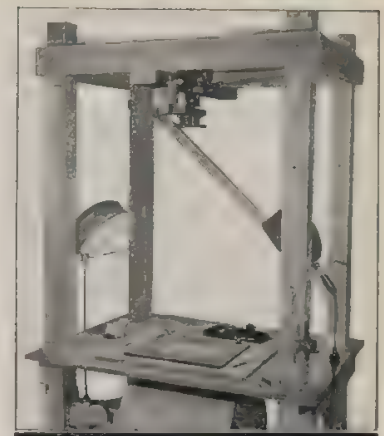
Carl Holmes

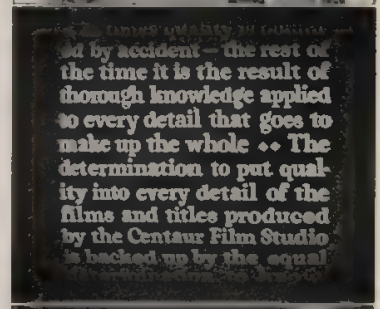
Author "abc of Lettering"

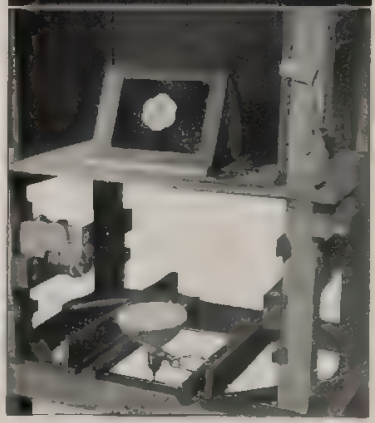
It might be well to take up here the two types of titles direct positive and negative. In the latter classification we may include reversible film in which the negative is printed upon itself.

Direct positive titles are those shot from negative layouts producing, when developed, a positive for projection. See Figure 8. All reversible film is in reverse position from left to right when viewing the emulsion side. This is due to the process which eliminates a negative—the negative having been printed upon itself and destroyed. Luckily our direct positive title will, therefore, match the reversible film with which it is to be used, the lettering reading backwards when viewing the emulsion side. Thus the copy printed in black on a white card will produce a title with white letters on a dark background. Dark backgrounds are always more suited to titles due to the minimizing of flicker in projection, and of more nearly matching the average scene in color. Because of the relatively large expanse of white in the copy, which fully exposes the silver of the film emulsion, double exposure trick effects possible to the negative, or reversible film, are practically impossible with direct positive titles. Notwithstanding this fact some mighty clever stunts have been done, and a little ingenuity will solve what seem insurmountable difficulties. I have read many articles on title making which purport to demonstrate the proper procedure for direct positive titles and which instruct the maker to develop as a negative. Most emphatically, the present writer claims, the title must be developed as a positive—it is positive film and the developer should be a high contrast formula. Formulas are given later in this article.

In the realm of negative, or reversible titles, the sky is the limit on trick effects. Double or triple, or any number of exposures are possible as well as movements, the mechanics of which are not registered upon the film due to the under dark color. In this category is an effect we might call a drop in. The letters appear from the plane of the audience and with a hawk like swoop fall into place. I accomplish this trick by means of screens on the sides of the title stand which transform the stand into a light tight dark box (Figure 9). Using a transparent title on a frame attached to the table top and illuminated from below an effect similar to Figure 10 is secured. The whole secret consists in excluding light from above which will register the mechanics of operation. Zooms, moving backgrounds or whatever you will, will perform to perfection in such a layout.







At top Fig. 1. Center Fig. 7, and bottom Fig. 9.

We will now consider the artistic side of title making. There are a few rules that if strictly adhered to will greatly improve the quality of any film production. One is to keep borders and decoration simple and modern, unless for a given

a Antiquity
b COLDNESS
c MONOTONY
d Quality
e BOLDNESS
f SOPHISTICATION
g FRIVOLITY
h DIGNITY
i Craftsmanship
j Cleanliness
k Strength
l SINCERITY
m RUGGEDNESS
n SPEED
o Femininity
p Smartness
q BEAUTY
r STYLE
s Emphasis
t Legibility
u JAZZMANIA
v SYNCOPATION
w Individuality
x Cheapness
y PERMANENCE
z modernity

out 100% 90% 80% 70% 60% 50% 40% 30% 20% 10% 0%
in 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

100% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100%

Type chart at top is Fig. 11 and is reprinted by permission from "abc of Lettering." At bottom the typewritten portion exemplifies the theory of a true lap-dissolve.

purpose you wish to establish a certain mood or atmosphere to your picture. The titles are there to bridge gaps impossible to telegraph in pictures and except in main titles, should do their work as unobtrusively as possible. Needless to say a single border or decorative unit should be used throughout a picture. Never jumble up the picture with different borders or style of decoration. All great works of art manifest absolute unity.

Keep lettering, likewise severely plain and legible, preferably displayed on a plain background. Lettering, or type choice if you will, is the "big bad wolf" of titles and you had better be plenty afraid. Remember, words are signs and symbols whose real meaning lies in the "pictures" they flash to the mind of the reader (Figure 11). Picture your thoughts in raiment compatible with what you wish to imply as well as express. Don't blame your audience if they interpret your type choice by the conventions long usage has established in their minds. Don't permit the titles to be the weak link that runs an otherwise perfect production. The way the letters are drawn, or the choice of a type face, are not mere incidentals to title making, but most efficient tools in the hands of one telling a story through the medium of a silent motion picture.

The sound picture can tell all, the silent must suggest, and type itself may vividly suggest many ideas and moods. It is equivalent to manner of speech, to the way an actor might read his lines.

Long usage has decreed that spoken titles carry no border or decoration. They are usually set in Italic, and may or may not carry quotation marks.

Always keep in mind this fact: **titles are the means to an end,** not the end in itself. In a stunt or comedy film you may smooth the works, but drama, industrials, educational or travel subjects require that their titles be submerged for the good of the whole. The perfection of art is to conceal it.

Direct positive titles are made on positive film stock, due to its greater contrast, and more economical price. You will find Gevaert or Dupont positive stock to be much more contrasty than Eastman's, but if you have delicate pictorial tones to reproduce, Eastman is the one to use. Of course you can make titles on regular reversible film, but this necessitates a positive layout, which involves considerably more labor. No more labor, naturally, if the title is hand drawn, but if type set, some means of reversing the black letters to white must be invoked.

For pictorial work I use the Eastman No. 16 formula, as follows:

Water (about 125 deg. F.)	64 oz.
Elon	17 grains
Sodium Sulphite, desiccated (E. K. Co.)	5 oz. 145 grains
Hydroquinone	350 grains
Sodium Carbonate	2½ oz.
Potassium Bromide	50 grains
Citric Acid	40 grains
Potassium Metabisulphite	85 grains
Cold Water to make	1 gallon

Develop at 65 deg. F.

For snappy, contrasty effects this formula is by far the better:

Hydroquinone	1 oz. 262 grains
Sodium Sulphite (E. K. Co.)	4 oz.
Sodium Carbonate (E. K. Co.)	1 lb.
Potassium Bromide	1 oz.
Water	1 gal.

Develop at 60 to 65 deg. F.

And for **really** deep blacks you will have to intensify. Good formulas for this were given in an article by William Stull, A.S.C. appearing in the July 1933 issue of this magazine.

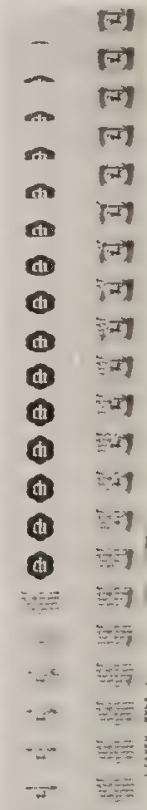
After your film has been cleared in the hypo bath, and thoroughly washed, rinse for two minutes in the following glycerine bath:

Water	1 gal.
Glycerine	3 oz.

This will last indefinitely and will help materially in maintaining flexibility in the film. Most amateur processors turn out brittle, badly curled film which "breathes" when projected.

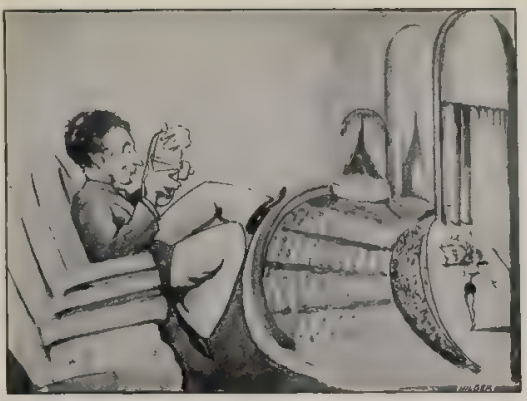
Before hanging up to dry, wipe off all excess water with a moistened pad of surgical cotton. After once hanging up do not change position or water spots may result. It is understood that you are hanging up short sections of film, if

Continued on Page 341



Upper left Fig. 10, and lower. The strip at the right is Fig. 5, left Fig. 4. This shows intermittent frames of a one and one-half second lap dissolve. The frames in the order in which they are shown are 1st, 3rd, 8th, 10th, 16th, 22nd and 24th.

"Agfa film is not mentioned only because the writer has not had the opportunity to use it. This article is the story of a personal experience and should not be construed as the magazine's endorsement of any material or product.



Hilger gives us a conception of himself nonchalantly "flickering" the stage show. He's now looking for the "fan dance" to complete his record.

An Amateur Steals The Show

by

Al. Hilger
Cinephotographer

OFTEN during my life have I heard the old adage "The world is your oyster if you find the way to open it!"

Which enigmatical saying generally interpreted means that if we crack the hard shell of our daily existence in the right place we can find all sorts of fun, pleasure, profit and interest all around us.

Never, however, until I came into possession of my first 16 millimeter camera did I realize the full truth of this adage—make this cockeyed old sphere of ours open up and disgorge pastime, hobby, amusement and entertainment for myself and hosts of my friends and family to boot.

I have focused on racing flies coming under the wire, panned parachute jumpers plummeting to earth, shot the family silly, even unto the third and fourth generation, close-upped a President of these United States but never in five years of picking or making my "shots" have I gotten the zip, the kick and the happy results out of a camera experiment or achievement as the one I'm now going to tell you about.

It may sound and seem like poaching, it may appear difficult—even impossible—but it's worth trying. I did it. I shot the complete, fast moving action of a colorful stage show. In the theatre—as one of the pay-as-you-enter customers! Not only once but several times, in several different theatres.

And here's how. I live in a metropolitan city in the Middle West—one which is well up in the first division of big towns of the country. A city with a half dozen or more de luxe motion picture theatres presenting elaborate stage revues in conjunction with their screen feature. There, I admit, I am more fortunate than many who will read this. But there are a lot of these sort of cities and 16-millimeter camera owners in them.

When subjects fitting my growing skill and equipment began to run scarce I hit upon the idea of attempting to film a stage show. I used a Victor turret model with an f 3.5 lens—okay for a wide stage. Where the stage and action is lit by one or more spotlights an f 8 will suffice.

Realizing that this was big game stuff, I loaded for bear—using supersensitive panchromatic film, which as you all know is three times faster than regulation under artificial light. Leave your tripod at home, it may cause you and your camera to make a forced exit to the street. Buy a balcony seat and pick a matinee or evening supper show as the best time to find a spot in the first row and give you some elbow room. That first row, center seat along the rail is one of the most important items in your preparations.

From then on the rest is up to you and your skill as a cameraman—not forgetting either the quality of your "box". Dancing teams, acrobatic acts, in fact any portion of the entertainment that has fast tempo and action should be your meat. Don't waste effort on the static stuff—monologists or dialogue bits where the actors are more or less stationary doing their routine.

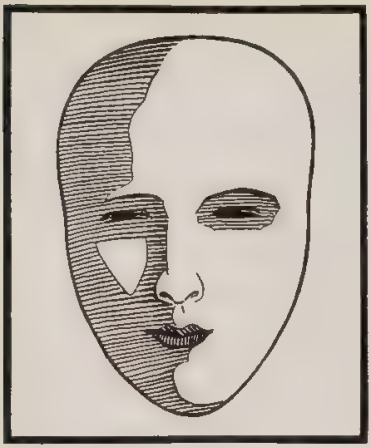
Dancing acts—adagio teams, chorus steppers and acrobatic stepping make ideal pictures. Usually a spotlight is focused on this sort of action. The light is generally a brilliant white, happily enhancing your photography. Sometimes it is soft blue or amber. Don't be afraid to shoot then. I have obtained some very unusual effects with this sort of lighting. Just make sure of one thing—keep aperture wide open!

There may be a question on the part of some readers as to possible resenting of the whirr of the camera by those sitting around one while filming. Using a Victor, as I said before, for this sort of filming adventure I have found the operating noise negligible. Anyhow the blare of chorus of the accompanying music usually drowns out such probable handicap.

What about close-up stuff? I have been asked by camera kamerads. Your 3½ or 4 inch lens fulfills every such need—even from the second or third row in the balcony.

Believe it or not I obtained one of my best pictures of a stage show subject shooting from the last row of the balcony. It was the celebrated comedian, Joe Cook, and a big colorful revue of his. A 3½ lens did the job—and a sweet one. The footage is now among the most prized and most entertaining in my private film library.

So despite the pessimistic words of Ecclesiastes, there is still something new under the sun—for the growing and vast army of 16-millimeter entrepeneurs anyhow.



The above sketch shows the effect of one light properly placed. This must be the basis of lighting and is explained in detail in the article

The One, Two, Three of Lighting

by

L. Guy Wilky, A. S. C.

FOR basic photographic, indoor lighting you need three lights. If not three lights, at least three light sources. I say three light sources as you might be able to effect some of this lighting with reflectors or with the light coming from the outdoors if you take the picture during the day.

The study of lighting would naturally start with the human face. We must determine the most complimentary lighting of a face. Experience has taught that a light placed at about a 45 degree angle from the face a little high so that it throws shadows around the eyes as shown in the sketch and so that it throws a high light on the cheekbone opposite from the light is the most complimentary lighting a photographer can use. Now, however we have created some very deep shadows, as the sketch indicates around the eyes and on the opposite side of the face. To soften these shadows the second light is placed at the opposite side of the face, a greater distance from the face than the first light and at about shoulder height so that it shines up a bit to kill the shadows around the eyes, under the nose, chin and other points that the first light, which is pointing down somewhat, necessarily creates.

This second light is placed at a greater distance so as to give a contrast in the lighting of the face. If it were placed at the same distance as the first light the lighting as it would photograph would be very flat. This arrangement still gives you the highlight on one side of the face and on the opposite cheekbone with the second light softening the shadows and bringing that side of the face out in softer photographic qualities. Frequently you will secure a much better effect if you place a diffusing cloth over the second light. This of itself will cut down its brilliance and as we say will not "burn-up" the subject. You see, some lights give what is commonly called a "hot-spot" that is you get a small circle of light in its focusing point that is more intense than the complete circle of light thrown by your lamp.

Now the third step is the placing of a light in back of the person to give you back lighting, to outline the person. Whether you place this high or low depends upon the effect you wish to secure. Frequently it is placed high to bring out the hair. This is especially true if the hair is dark. However, we say the placement of this depends upon the effect you are after. You must be careful not to let it interfere with your front lighting; that is in such a way as to kill the shadow effect on one side or to bring out too strong a highlight on the other side, unless, of course you are desirous of getting just that effect.

A low light as you know will shine through loose strands of hair and gives a very pleasing effect. This possibly can be used more with blondes than with brunettes because the hair naturally photographs light. Also your background compared to the person and their clothes will effect the placement of this light. If the person is wearing dark clothes and the background is dark you will want to outline the entire figure of the person.

In motion picture work it may require that you use a second back light as the person is moving about. It might be advisable to stagger these back lights the same as the front lights so that you do not have a lighting that does not permit them to walk out of both lights at the same time. Also the staggering of the lights will let you have a highlight from one of the lights at all times when they move away from one light toward the other light.

There is no hard and fast rule on lighting, the number of feet to place a light, etc. This must be determined by the effect you wish to secure. Of course there is a rule of the maximum distance you can place a light with relation to the subject, for this reason we are not going into the subject of the distance these lights should be placed from your subject. You will find all of that data with every roll of supersensitive film you purchase. Furthermore you will find from experience just how to secure the effect you will want. Whether a high key or low key photography will depend upon the distance you place these lights, the diffusion of them and the stop you use on your camera. Each individual usually works this out for himself. They interpret their own feeling and their own artistic tastes by the use and placement of lights in the set.

I Am At It Again

by

Raymond Harvey,
Cinephotographer

I M At It Again This time it's a focus ng tube, alignment gauge, sunshade, filter holder and a slid ng lens mount

Something like a year ago I fn shed my own 16mm camera and felt I had about everything incorporated in it that I should want However when I started shooting I would find a few shortcomings here and there, that is, additional conveniences I wanted

I own a couple of Victor cameras, so decided to experiment with one of them as my basis

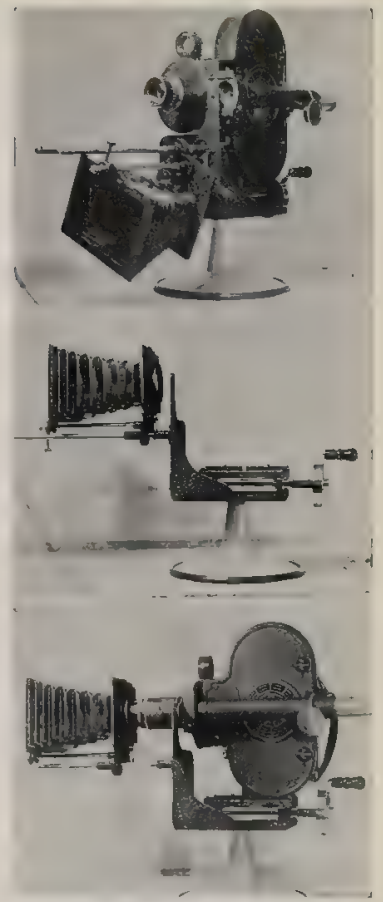
With the rewind feature now available in that camera I now feel I have something that is going to keep me satisfied for at least another year

The illustrations on this page give you a more or less clear conception of the construction of the sun-shade and sun-shade holder So as to get away from having different mountings for each lens to hold this sunshade I made it to rest on top of the tripod or I can fasten it directly to the camera for hand manipulation. This shade will slide fore and back depending upon the focal length of the lens It has a holder for filters and mats. I made the bellows from the bellows of an old still camera However, this shade has one additional important feature which is more apparent in the top illustration It is that portion which extends up in front of the focusing tube In this extension I bored a hole By means of this I am able to fasten the slide in which the lens is mounted so that when the camera is racked over by means of the alignment gauge the lens comes directly in front of the focusing tube By this arrangement you will observe that the lens is always in the same position relative to the sunshade In other words, the lens and sunshade remain stationary but the camera moves

The center illustration gives you an idea of how this sunshade and alignment gauge is constructed By turning the little crank in the rear a turn or so I move the camera in either direction either away from the lens or in front of the lens and in taking position When the camera is moved away from the lens the lens then is centered on the focusing tube, and in view of the fact that the lens is always in the same position I can view my scene through the focusing tube just as it will appear on the screen This is mighty fine for close-ups, titles and such scenes where I do not have to pan as it is not necessary for me then to look through the view finder at all

Also with the adjustable view finder of the Victor it is possible for me to adjust it with the picture I see through the focusing tube so that I always feel certain that what I see in the view finder am getting on the screen, as I have checked it accurately

The focusing tube gives me an upright picture I have arranged the optics in this so as to give me the picture upright instead of reverse, as is generally the rule with positive optics



Top photo shows sunshade thrown away from lens Center alignment gauge handle and bottom lens in front of focusing tube.

The sliding lens mount meant that I had to reconstruct the front plate of the camera which usually contains the turret head The lens is merely mounted on a metal slide In this slide I have made a threaded opening which is absolutely the same relation to the film as was the standard mount This of course was necessary in order to take care of my focus Also it was necessary to have very accurate measurements of the distance between the ground glass of the focusing tube and the lens itself These had to be identical so that my focus on the film would be the same as the focus I secured through the tube

The alignment gauge also had to be very accurate. The

Continued on Page 331

A Backyard Continuity

by

Marie Stewardt

I AM the one who must think up the plots and ideas for the taking of pictures in our family. The great desire to expose film is firmly and deeply lodged in the bosom of the male. But what to take is put up to me more and more as this virile bug bites him occasionally since he took the first pictures which included the youngster and the rest of the family as well as birthdays, Christmas parties, Hallowe'en and other events.

Now those in between time pictures are the ones that make us sit down and wrinkle our brows prematurely—or possibly I should have said my brow, because it is entirely up to me.

I suppose human nature is human nature whether it is here in these fair United States or in Eskimoland and when the first flush of a new season slithers through our windows some morning the obsession "That now is the time to put something new on photographic emulsion" must be satisfied.

Knowing this I anticipated winter several months ago and decided to prepare a little continuity against the day when the 16mm germ again attacks the cinephotographer of our home.

My snow boots are going to be the hero of this picture. It is to open with a close up of me putting on a woollen sock, this will pan over to the hand reaching for the boot, putting on the boot and then starting to lace it. It will cut from here to the boots walking out the front door down the steps. Then the camera will be placed in front of the boots showing them walking down the steps until they reach the last step. As the right foot is to step off we will cut with that foot half way out.

Now remember this is made without any snow outdoors, so we have to wait from that point until we have snow. Then we will go to some nearby resort or playground and have those boots again on the last step and this time start in the action with the right boot where it stopped in the scene at our own home. This time, however, it continues its action and steps into the snow, walking toward the camera. Then the camera will be placed in back of the boots and they will walk forward with the camera gradually taking in the entire person.

From here on we decided to let circumstances take their course, showing skates being put on the boots and then scenes of skating. Showing the boots alongside of a ski and then the ski slide. Maybe just a bit of rough house. But as the action and the incidents continue take occasional flashes of the boots, showing them getting wet and wrinkled from the activity.

We will show them in association with other boots of people in the party just tramping. We are going to try what is sometimes termed a 'dolly shot' in the studios by mounting the camera on a sled and endeavoring to pull it smoothly over the snow, showing these boots walking through the snow. Of course, there will be the trek with snow shoes through some virgin snow if we can find it.

The boots will act as the excuse for the picture. The family and friends will be running through it in the activities of the day.

The wind up, however, will find the boots just dragging themselves through the snow, wet, wrinkled and thoroughly used. The last scene will be back in the house again. The same setting as the first scene. Showing the boots being unlaced and as they are set down they sort of fold up on themselves and topple over dead tired.

That's going to be our snow picture this year. If one had some of these more modern devices that are on the later cameras such as winding backward, all of this action could be smoothed out very wonderfully by lap dissolving and fading at different points. Especially from one type of sport to another and from a close-up of the boots themselves to the activity that is being pursued.

This gives us a picture that will not require any titles, except the main title, of course, and if necessary the name of the location if it is some place that we go to especially for a holiday.

I find one drawback in being the scenarist in the family and that is that the cutting and the editing of the film is slowly but surely becoming a part of my work. The camera master of our home is patting himself on his back with his photography and other technical phases of the camera, so I have decided to have a stock title card made which will say, "Story continuity, cutting and editing by yours truly." Maybe that will show him who the boss is around our house.

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Sierra Club Has New Officers

• This is the season for elections. The Sierra Cinema League of Fresno has elected their officers for the coming year. E. E. Hollister was elected president, B. H. Casebolt, vice president and R. C. Denny, secretary and treasurer. All three of these men are enthusiastic cinephotographers. Both Casebolt and Denny are inclined toward the mechanical and make most of their pictures via the negative and positive method, developing their negative and doing their own printing.

Pittsburgh Club Reorganized

• In September this year the group of cinephotographers which formerly composed the Amateur Motion Picture Club of the Academy of Science of Pittsburgh was reorganized into the Pittsburgh Amateur Movie Club, an independent organization. This club starts out with a nucleus of 75 members and it is the anticipation that it will have a roster of between 100 and 200 members within the year.

C. Lynn was elected president, A. W. Ginn, vice president, and Dr. Joseph A. Boarts secretary and treasurer. The club will hold monthly meetings.

Metropolitan Club Entertains

• At the November 9th meeting of the Metropolitan Motion Picture Club of New York City they will have as their guests of the evening the Mount Kisco Cinemats headed by Dr. Charles F. Chapman, president. The Mount Kisco organization will present two pictures made by their members. One is entitled 'Ceramics,' which shows in complete detail the old time process of pottery making; the other is "The Night Call,' which tells the story of a busy doctor's life through the portrayal of incidents surrounding an operation for appendicitis.

The program will also include the first of the informa contests scheduled by this club for the year.

Chicago Completing Fair Picture

• The Chicago Cinema Club is reaching the 'last round up" on its documentary pictures of the Century of Progress Exhibition.

Through the cooperation of Cooney, Randolph Major Lohr and the officials of the Century of Progress much material has been accumulated by the members of this progressive club including special events, scenic effects and the important material of a record nature.

Now that the fair has closed and the stream of visiting friends and relatives have dwindled, work on the editing of this picture will be started.

Zutto Dollies His Victor Camera

• Harry Zutto, who in association with the Zutto Players of Los Angeles has made several 16mm dramatic productions, has turned his facile mind toward the mechanics of picture making and in his latest production "Awakening" has employed the dolly for follow-up shots.

The illustration on this page not only shows the dolly as Zutto has made it, but also several other accessories which are made a part of the camera and dolly. Of interest is the light in the front and of course the contrivance he has built in front of his lens. In some near future issue we will give you the details of this gadget.

Warner Heads Chicago Cine Club

• At a recent meeting of the Chicago Cinema Club officers were elected for the new club year. Those voted into office were S. F. Warner, president; Warren R. Sandage, vice president, H. W. Clark, secretary and H. W. Macomber, treasurer. The program committee will consist of G. S. Bowstead as chairman. Bowstead acted as president during the past year. Others on this committee include J. D. Brubaker in charge of film activities, George R. Turtle in charge of study groups and N. E. Johnson in charge of awards and contests. Chairmen of six other committees were elected. They were George R. Turtle, Finance Committee, Ray Carlstrom, House Committee, E. J. Hamme, Membership Committee, C. A. Paulson, Technical Committee, Paul Klugh, Administration Committee, Warren R. Sandage, Century of Progress Special Film Committee.

Boston Club Offers Prize Pictures

• At the presentation of the American Cinematographer's 1932 Amateur Prize Winning Motion Pictures by the Boston Cinamateur Club an audience of 230 cine enthusiasts were present to view this offering, according to T. H. Patten, secretary of that organization.

Much enthusiasm was evinced by all those present, according to report, at the work done by those who made these pictures.

The club is now active on a group production which will bear the title "Bums in Uniform."

Great Britain Launches 16mm News Reel

• One of the aggressive Great Britain 16mm concerns, Fox Photos, has launched a monthly 16mm news reel which they are releasing under the general title of 'Film-At-Home News." According to the news coming to this country on this venture it is stated that this news reel is produced and directed by journalists.

Whether this release will parallel the professional news reel has not been stated but whatever its policy is in relation to the professional subject will undoubtedly have some bearing upon its success which will be eagerly watched by all 16mm distributors throughout the world.

Miniature Camera Book

• George W. Hesse, who has contributed several articles to this magazine and other publications in the photographic field, has authored a 62 page book which is given the title 'The Book of the Miniature Camera." It is published by the Fomo Publishing Company and is another of their series of 50c publications on the popular miniature cameras.

The booklet touches upon many phases of miniature photography in Hesse's usual thorough manner, giving details of many small cameras, the use of enlargers, exposure meters, formulas and the many other details which the miniature enthusiast will use in the pursuit of his hobby.

L. A. Club Closes Contest

• The annual contest of the Los Angeles Cine Club officially closed with its November meeting when the nine pictures selected by the Club Committee were turned over to the AMERICAN CINEMATOGRAPHER for final decision. Winners will be announced at the Club's December meeting, at which time new officers will be elected for the ensuing year.

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I Am At It Again

Continued from Page 327

ens must be perfectly centered on both the film aperture and the focusing tube aperture

All of these gadgets do not mean that I cannot use the camera in the conventional way in the hand The only addition to the camera itself when taken off the tripod is the focusing tube at the side

While the lay-out may sound a bit elaborate and intricate, still it is very simple and has given my camera a great deal more flexibility with not much additional equipment.

Mechanical Engineering

Continued from Page 315

missible with these lenses; and what is done is to cement them to holders by means of a layer of that viscous solid pitch The solidity of pitch withstands the forces applied to the lens in grinding and polishing, while its property of flowing slowly ensures that the lens is held without strain

But the pitch must have the right degree of viscosity and this must be uniform throughout the mass. the means of ensuring these things or mitigating the ill-effects of their absence was one of the secrets of the skilled artist-craftsman During the War, Leicester had to produce lenses of the highest accuracy in considerable quantities and for many purposes The supply of skilled craftsmen was totally inadequate, and we had to find means by which unskilled help could do work at least as good as that previously done only by craftsmen of long experience This was in its true and broad sense a mechanical engineering problem

By employing disks of glass with two polished flats at opposite sides of their perimeters, and viewing the glasses by polarized light transmitted through the flats with an apparatus known as a Babinet compensator, we were able to see the strain produced in the glass when one surface was heated by applying hot pitch We saw the strain released as the pitch and glass cooled, but if the pitch or portions of it, were truly solid and not a viscous-solid, some strain of the glass remained permanently If, on the other hand the pitch was not sufficiently solid, the strain disappeared soon Thus a test for the quality of pitch was established and we learned that it must be self annealing at ordinary temperatures and, for example, retain some strain for half an hour but none for an hour For shop practice an equivalent test was substituted in the form of a Brinell test applied for a standard time

And then we saw that the artistic method of the old craftsmen had been essentially the same. for he chewed the pitch to test it that is, he made Brinell tests with a time factor by means of his teeth! His was a qualitative rather than a precise quantitative method and it took him many years to learn But as an art based on tradition and upon habit gained by experience, in what respect we must hold it

Besides holding individual lenses without strain, pitch is used as shown in Figs. 20 and 23 for attaching numbers of lenses simultaneously to one holder with their surfaces conforming to one geometrical spherical surface so that for economy they may be ground and polished together as one unit But this of course is not possible with deeply curved lens surfaces some of which must be worked singly

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Prior to the War lens-polishing machinery of the kind already referred to, comprising one or two cranks and connecting rods to move the tool and weights to apply the necessary pressure were in general use But the eccentricity of the cranks which determined the size of orbit of the upper tool, the eccentricity of that orbit with respect to the work that is the size of the epicycloid described by the upper tool on the lower one (commonly the work), the respective rates of movement of the two members, and the pressures between them were all varied according to such judgment as the operator possessed The product varied great-

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ly with the skill of the operator, and long experience was necessary to get good results. Much evil resulted from the inertia of the weights, which moved up and down as the attachment to the upper tool moved to and from the zenith of its vertical orbit.

During the War, in order especially that hundreds of thousands of binocular telescope objectives of the highest quality could be made by inexperienced girls, I reduced these variables by designing a machine whose geometry will be seen in Fig. 23. Here the lower member is a block of twelve lenses held by pitch to one metal holder 'c,' and this is slowly rotated on its vertical axis. The upper member 'e' the polisher faced with a wax composition, has a central depression in which is seated the end of a crank pin 'a' carried on an inclined crank shaft 'b.' The axes of this shaft and of the lens holder 'c' intersect in the centre 'd' of the sphere of lens surfaces, and thus the crank pin at every point of its normal circular orbit would be at a constant distance from the lens surfaces without guidance by the polishing tool 'e.'

The crank arm 'f' is carried by a pivot 'g' and urged by a spring 'h' so that the pressure between the polisher and work may be adapted to requirements. The lens holders for all sizes of sphere within the capacity of the machine are so constructed that the centres of curvature lie at the fixed point 'd' where the two shaft axes intersect, and the crank pin is adjustable by sliding in the crank arm to accommodate work of any curvature. Being set at an angle to the crank shaft and in line with the point 'd,' the crank pin, when so adjusted, automatically varies the size of its orbit in strict proportion to the radius of lens curvature. At the same time the eccentricity of the orbit with respect to the work axis is varied automatically and precisely as it should be varied.

This machine entirely eliminated the inertia effects of previous machines, and it eliminated all the variables but one, the pressure between the tool and the work. But for this it provided a measure of value, being graduated with a scale of pressures by which the machine could be set.

It was this substitution of science for art which enabled England to produce during the War very large numbers indeed of lenses for prism binoculars of a kind which prior to the War she imported from an enemy country. The quality of these lenses was uniform and of the highest standard, and notwithstanding the increase in labor rates and expenses generally, the cost was below the pre War cost. A complete machine comprising eight pairs of spindles is shown in Fig. 24.

The sixteen spindles are driven by helical gears and the two driving shafts are connected by a chain and sprockets with a hunting tooth so that the same phase of motion of work and tool recurs at sufficiently long intervals.

On this machine is seen another device which, though stimulated into being by the War, I had conceived a generation before. The operation of feeding rouge and water to the lens polishing tool had been performed with a hand brush. If the film of water between the polisher and work exceeds in thickness the diameter of the grains of rouge, no polishing can occur. If the film dries the polisher heats and adheres to the lenses, and may tear them from the tool. Thus the operator has to exercise ceaseless care in watching his work and keeping it sufficiently moist, and the number

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of spindles he can attend is very limited. Also, the work is very messy.

The traction between polisher and work rises in value continuously as the polisher dries after being wetted. Obviously the traction is a function of the rate of polishing and the object should be to maintain this as high as possible short of the danger point.

The rule must therefore be to apply the rouge and water continuously or frequently when, and only when, the traction is at a predetermined value short of the danger point. This cannot be done manually with certainty, but it is done by the device shown in Fig. 24. Here a supply of rouge and water is kept in circulation in a closed circuit of pipes and provided with pneumatically closed valves. One of each pair of machine spindles is mounted with slight lateral freedom so that it may be moved by the tractive effort between the polisher and work. Normally, by means of a spring whose strength may be varied, this motion is resisted and a vent in the pneumatic system is closed and the water supply thereby cut off. When, however, the traction rises to any value predetermined by the setting of the traction spring, the vent is opened and water and rouge are supplied to the polisher. Thus the whole process becomes automatic, the operator is relieved from much strain, his work is more cleanly, and he produces more and better work; and this is the normal result of applying to an art the science of mechanical engineering.

When the two surfaces of a lens have been polished and tested, the peripheral edge of the lens must be made cylindrical, of diameter to fit closely the cell in which it is to be mounted, and with the axis of the cylinder containing the two centres respectively of the two spherical surfaces of the lens.

The primitive way of doing this was to cement the lens by one face to a lathe chuck, to move the lens about on the chuck before the cement set, until reflections from the two lens surfaces appeared stationary while the lathe rotated. The edge of the lens was then either ground by an emery charged wet block of copper rigidly applied to the lens edge, or by turning it with a hand tool, commonly a "three-square scraper."

These primitive appliances have been replaced by those shown in Figs. 25 and 26, and with these it is the regular practice to grind any number of lens edges in succession within 0.0003 to 0.0005 inch on diameter according to need, and with the two centres of spherical curvature within 0.0002 inch of the axis of the cylindrical edge.

And here, when we reach the problem of mounting a number of separate glasses concentrically in one mounting and the subject of compensating, in each assembly, such small residual variations of

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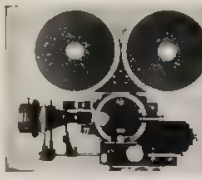

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glass constants, lens thicknesses, and curvatures as inevitably occur, I must stop for lack of time

Trans Optica Soc 1922-3, vol xxiv

S.M.P.E. Elects Officers

• The Pacific Coast branch of the Society of Motion Picture Engineers elected new officers for the ensuing year at their November meeting

Emery Huse, A.S.C., of Eastman Kodak Company, was reelected to chairmanship. Joseph Rackett was named secretary and treasurer. Rackett is with Technicolor Company. Joseph Dubray, A.S.C., of Bell & Howell Company, and W. C. Harcus were elected managers

Moving Mapping Camera

Continued from Page 312

flight, the camera can be started at that point. The other alternative is to thread up a second magazine of film enroute if necessary, circling around to insure preserving the sequence. In any case, one loading of the magazine will map the important part of the journey, that's what will count.

The films will be developed at the base camp, and when they are brought back 4 x 5 inch enlargements will be made from each frame. These will be set up in one of the standard aerial contour mapping machines and a regular contour map of the flight prepared. This work is likely to take a year or two after the expedition gets back.

Judging from the quality of the tests made by Captain A. W. Stevens and Mr. Magnus of the U. S. Army Air Corps (Figure 5), it is expected that the map will have all the detail that may be desired.

It is unnecessary to call attention to the value of such a map, but some idea of its importance can be gauged by the fact that no such aerial map of the Antarctic has been made previously. The results of this one are therefore awaited with great interest.

To supplement the special camera, special tripods, lenses and other accessories were taken by the expedition. These will be used for ordinary movie work both on the ground and in the air. Figure shows the equipment set in the nose of a plane for mapping (of course, in flight, the cover would swing into place, only the lens would project through).

Notice how the camera is mounted in a U-shaped bracket. Ratchet locks are provided on the two end clamping screws so the camera tilt can be set with precision and locked there.

Figure 2 shows the camera with the lenses removed to show the special shutter mechanism plate mounted behind the turret. The camera is shown set for normal (movie) operation. When mapping

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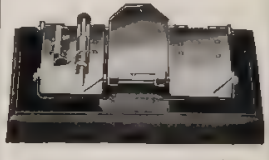

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s to be done, the set screw at "normal" is loosened and moved around to the "intermittent" setting and locked. This engages the auxiliary shutter mechanism.

The motor is geared to expose one frame every six seconds. When the main shutter is in the open position, the auxiliary shutter is tripped giving an exposure of 1/100 second.

Figure 5 shows the type of results obtained. Careful examination will show the amount of overlap in each frame. This illustration also gives a very clear idea of the effectiveness of this type of "map" over towns and countryside. How much more valuable over the unknown Antarctic terrain.

The mapping EYEMO opens up great possibilities for aerial reconnaissance work of all kinds. Pipe and power line surveys; oil, mining and geological investigations; a cheap mapping method for large areas; timber surveys, etc.

Once again the versatile movie film opens up a new field.

Miniature Development

Continued from Page 313

Should you possess an Ellison or QRS camera or a 35mm motion picture camera you can easily and quickly make enough gamma to last you for a long time.

Having completed our supply of gamma, we are ready to systematize our developing. Cut three strips of the undeveloped gamma about four inches long. Start developing these pieces, using the developer and following the procedure that has proved most satisfactory to you up to the present time. Remove these strips from the tank at the following times: one a few minutes before your average developing time, one at the average time, and the remaining strip several minutes later. These strips we will call our guide-gamma strips. They are to be saved for future comparison with other gamma strips. These guides will probably look like the one illustrated in this article, which were developed 7½, 15 and 22 minutes, respectively. The center one is my normal gamma. Below each one I have drawn an imaginary cross section of the gamma, showing the increase in contrast in proportion to the developing time.

The next time you develop a roll of miniature negatives, follow this simple procedure. Place in the tank with the roll of film two small pieces of the undeveloped gamma. After the time has elapsed that you developed Guide No. 1, remove one piece and place in the hypo. (In the dark of course.) Compare this piece with Guide No. 1. If it matches, continue developing until you reach your normal time (Guide No. 2). Comparison of the two gammas will indicate the speed of the developer, and it is a simple thing to determine whether you should stop developing a few minutes before your normal time or vice versa. The piece of gamma that remained with the roll of film will be a record of how far the roll was developed and the present condition of the developer.

It is a good plan to save these records, for by them it is possible to keep your developing uniform. The roll that you develop next month will receive the same development as the present one. To me these records are a check on contrast and exposure. I know definitely whether my trouble lies in my exposure or my developing. If it is the developing, I can raise or lower the standard of contrast by raising or lowering the con-

Illustration shows 9 of the 11 Interchangeable Lenses

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trasts and developing times of my guide gammas.

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Try this aid and see if it doesn't help you.

Pearson With DeVry

• Elmer Pearson, former Vice President and General Manager of Pathe Exchange, Inc., has become the new General Manager of Herman A. DeVry, Inc., the well known manufacturer of portable sound projectors and cameras.

Mr. Pearson's first campaign will be the launching of the new DeVry Straight Feed Portable Sound Projector, the DeVry Double and Single Recording Camera, and the coming DeVry 16mm Sound unit.

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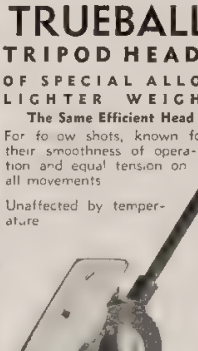

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Photography Radiations

(Continued from Page 311)

series of photographs of distant scenery. These are taken on Ilford infra red plates with infra-red filter, using a Taylor-Hobson apochromatic process lens. The "color curve" of such a lens is shown in Fig. 1, where the aberrations is greatly exaggerated. The marks show the points obtained by calculation, the two end points, surrounded by squares being in the invisible regions, were found from refractive indices given by the Hartmann formula, the other refractive indices were given by the glass maker. The circles show the positions found by measurement on the actual lens, using a monochromator. They are seen to agree very closely with the predicted positions. The series of lines shows the "best focus" positions found by photographing through filters having transmission through a range of wave lengths given by the lengths of the lines (the blue and green filters overlap). It is seen that these positions also agree reasonably well with the predicted curve, except in the case of the infra-red which shows less aberration than would be expected. The explanation is to be found in the change of spherical aberration with wave length which produces a change in the position of "best focus."

Fig. 3 shows the spherical aberration for the two wave lengths 5893A (sodium D) and 8000A (infra-red). It will be seen that when the spherical aberration is "corrected" for D, it is "under corrected" for the infra-red, causing the position of best focus to be shorter than it would otherwise be. It may be added that the converse happens at the blue end of the spectrum, the spherical aberration being "over-corrected" for that region.

On the whole the experimental results are seen to be in agreement with the predicted values, and with the data at his disposal the optician is able to proceed to adjust the corrections of his lens for the infra-red region without further difficulty.

Good With Coogan

● Frank Good, A.S.C., who photographed all of the Jackie Coogan productions when Jackie was the youthful idol of the motion picture screen, has been contracted by A. A. Allen, producer of the new series of Coogan subjects, to again direct the photography on these pictures.

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(Continued on Page 340)

Recent Patents Pertaining to Motion Pictures

Compiled by
Patent & Technical Information Service
1334 New York Avenue N. W.
Washington, D. C.

October 10, 1933

1,929,626. Soundproofing Picture Recording Camera. Lee de Forest, New York, N. Y., assignor to De Forest Phonofilm Corporation, New York, N. Y. In an apparatus of the type described, the combination comprising a support, a photographic recording camera mounted on said support, and a container having a transparent window portion therein in alignment with the light aperture of said camera, said container enclosing said camera in air tight fashion and adapted to be exhausted of air.

1,929,685. Reflector System for Stereo-Cinematograph Cameras. Edmund Fe., Berlin, Germany. A reflector system for stereoscinematograph cameras, comprising a single objective, reflective units with reflectors arranged in groups at both sides of the optical axis of said objective, each group being capable of displacing rays parallelly onto said objective and means for moving said units in continuous curves while maintaining the reflectors parallel to their initial position, to alternately bring each group to the exclusion of the other into position, so that the reflected light is incident on the objective.

October 17, 1933

1,930,498. Optical System for Motion Picture Photography. Walter L. Wright, Santa Monica, Calif., assignor to Synchrome Corporation, Los Angeles County, Calif. An optical system for making simultaneously a plurality of like chromatically different pictures of a single subject on separate areas of a film, including a single lens, light dividing means between the lens and subject receiving a shaft of light from the subject and dividing it into a plurality of like shafts, and filtering means in the shafts of light from the dividing means making the shafts chromatically different, the filtering means including filters of different colors in the shafts of light between the lens and light dividing means and filters in the shafts of light close to the film, the two filters in each shaft of light corresponding in color.

1,930,913. Film Editing Machine. Roy V. Terry, Montclair, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y. In a film editing machine, a sound recording unit, a film viewing unit having a picture film viewing lens, a common driving means for both units arranged to maintain a synchronous relation between film sound records and film picture records, mem-

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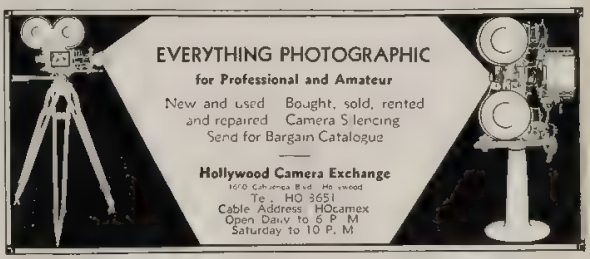

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(Continued on Page 342)

bers for operating two delivery reels and two takeup reels, means for operating said machine with said two delivery reels and said two takeup reels for simultaneously editing the picture record and accompanying sound record of separate films, said picture record film being routed from one of said delivery reels through a film guide and picture framing mask under said picture viewing lens and over guide rollers individual to said film to one of said takeup reels, said sound record film being routed from a second of said delivery reels over guide rollers individual to said film through a sound translating position in said sound reproducing unit to a second of said takeup reels and means for operating said machine with one of said delivery reels and one of said takeup reels for simultaneously editing the picture record and accompanying sound record of a film having both said records thereon, said single film being routed from said delivery reel through said picture guide and picture framing mask under said picture viewing lens and through said sound translating position in said sound reproducing unit to said takeup reel.

1,931,128. Film Printing Machine. Arthur J. Bradford, Detroit, Mich., assignor to General Electric Company. Aperture presetting apparatus for a film printing machine comprising an aperture varying member, means for retaining said member against movement, a pair of resilient members between the aperture varying member and the retaining means having initial tension and tending to rotate the aperture varying member respectively in opposite directions, a presetting member arranged to increase the tension of the respective resilient members when moved in opposite directions and means controlled by the film for releasing said retaining means.

Mechanics of 16mm Titles

(Continued from Page 324)

you are handling a long strip, a drying drum is a necessity to avoid badly "frozen" bends in the film.

Skill of the workman has much to do with the success of any process, and more particularly with the manipulation of motion picture film. But if you have been careful up to this point, and the film dries in a dust free room, it should turn out clean, except the celluloid side may be streaked with water spots. These streaks will readily yield to alcohol. Dampen a bit of chamois in alcohol and go over the entire film. This manipulation is better done on a drum, but you can put down a few layers of cheese cloth on a board, and thumb tack each end of the title to the board. This will furnish a solid base for wiping.

Dirt, grease or finger prints may be removed from the emulsion side with carbon tetrachloride, or any of the many preparations sold for this purpose. Use a similar procedure, though be more careful o fthe wiping action, using a piece of plush. I find the little plush pads sold in the dime stores for the application of face powder to be ideal for this purpose.

Painstaking care from first to last is the prime consideration. A little time spent in testing may save much fruitless effort. There is nothing in this world that one man can do that another cannot do better having the former's experience as a starting point—so godspeed.

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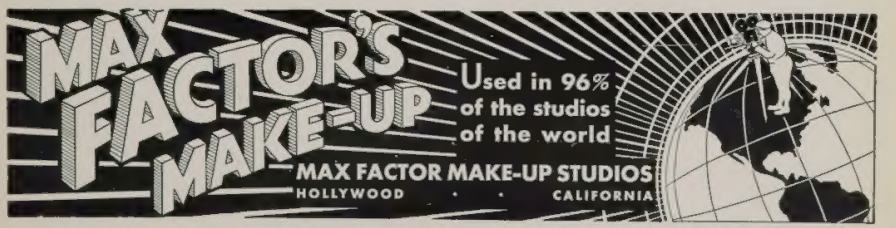

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SOUTH AMERICA

Buenos Aires: Argentine Rep., Casa America Ltda. S. A. Avenda de Mavo 959.

Photography of the Month

(Continued from Page 316)

some effects were obtained—while the public at large will surely be completely mystified). Under such conditions it is obvious that Cinematographer Edeson worked under many restrictions, so while the film does not by any means represent his best work, he is heartily to be commended for his achievement. Mr. Fulton deserves an orchid for his work

8mm Picture Ranks High

(Continued from Page 321)

tains many effects which were undoubtedly secured with one of the more modern cameras. However, it was a very close tussle between him and W. J. Seeman's offering, "Prairie Schooner," which was also dotted with effective wipes and fades, but in addition was tinted and toned. This also employed his youngsters in a very interesting and well photographed story.

Voss's Kodacolor "Gold Diggers" was an interesting study of several sour doughs out after the elusive shiny grains. Voss handled his camera in an interesting fashion on this subject.

Leslie P. Thatcher offered a well edited picture in "Mighty Niagara" with a preponderance of good photography.

Dr. McAfee presented a technical subject in a manner that was interesting to the layman as well as the dentist. His photography was consistent and his continuity thorough.

Charles and Robert Coles showed a fine knowledge of the use of filters in their twin subject, "Cascade and World's Fair." Also they showed a grasp of composition and camera angles that was refreshing.

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